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FROM THE

GRAY HERBARIUM

OF

HARVARD UNIVERSITY

NEW SERIES

62

VOL. III—Nos. 51–75

1917–1925

CAMBRIDGE, MASSACHUSETTS, U. S. A.

MISSOURI BOTANICAL
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Proceedings of the Boston Society of Natural History.

VOL. 36, No. 1,
p. 1–103, pls. 1, 2.

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BY HAROLD ST. JOHN.

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Introduction.

In the summer of 1913, the writer made a botanical collecting trip to Sable Island, Nova Scotia. The journey was taken at the suggestion of Prof. Merritt L. Fernald, without whose continued inspiration and practical assistance, its results could scarcely have been brought together in the present report. There are many other acknowledgments to make, especially to Dr. B. L. Robinson, who arranged to have the writer go as a collector from the Gray Herbarium, and who has forwarded in every way the completion of the work. Miss Mary A. Day Librarian of the Gray Herbarium, has frequently been of great assistance, especially in bibliographical matters. The writer wishes particularly to express his thanks to the responsible Canadian Government officials because of their constant readiness to make the expedition possible and pleasant. Unless a shipwrecked waif, one may not land on Sable Island without a permit from the Government. Mr. A. Johnston, Deputy Minister of Marine and Fisheries, of Ottawa, and Mr. C. H. Harvey, Agent of Marine and Fisheries, at Halifax, gave permission to visit the island and arranged for transportation on Government steamers. The Superintendent of Sable Island, Capt. J. U. Blakeney, both officially and personally, was helpful in every way possible, as were the members of the staff of the Life Saving Stations, the Lighthouses, and the Marconi Station. In Halifax by good fortune it was possible to meet Mr. Robert J. Bouteillier, former Superintendent of Sable Island. His unusual intelligence and keen powers of observation had given him during his long period of residence 28 years, an unrivalled knowledge of Sable Island and its phenomena. This knowledge he has frequently shared. To the late Mr. J. M. Macoun of the Canadian Geological Survey and to Dr. H. T. Güssow of the Central Experimental Farm, Ottawa, thanks are extended for the loan of specimens. Mr. Edwin R. Jump has kindly read part of the manuscript and checked it with his intensive knowledge of the history of Sable Island. The accompanying plates were drawn by Mr. F. Schuyler Mathews.

Present Status of Sable Island.

Stretching between Cape Cod and Newfoundland is a series of shoals or banks, Nantucket Shoals, Georges Bank, Brown's Bank, La Have Bank, Sambro Bank, Emerald Bank, Sable Island Bank, Middle Ground, Canso Bank, Misaine Bank, Artimon Bank, Banquereau, St. Pierre Bank, Green Banks, and the Grand Banks of Newfoundland. In all this stretch there is but one spot above high-tide level, Sable Island, a long crescent of sand dunes, twenty miles in length and less than one mile broad.

The visitor to Sable Island will start from Halifax, Nova Scotia, and steam eastward 150 miles. If the weather is calm and there have been no northerly winds for two or three days, the steamer will approach the northerly, that is to say, the inner side of the crescent-shaped island, and anchor a mile or more from land. Surf-boats put out from the beach and soon the landing of the few passengers and the very important supplies is begun. On the way to the beach there are three troublesome bars that must be crossed on the crest of a big wave, so the trip is exciting enough for the most venturesome, and all the passengers are glad to have the boat's nose ground in the soft sand of the beach, above which rises a steep sand dune. If he climbs the tall look-out mast crowning it, he will see that this dune is continued as a ridge or range of dunes skirting the top of the North Beach throughout the whole length of the island, and that this ridge called the North Ridge, forms the backbone of the island. Near the east end of the island the dunes attain their greatest height, and at one place between Life Saving Stations Nos. 3 and 4, the North Ridge rises to a peak called Rigging Hill, nearly 100 feet in height. From the North Ridge the dunes run inland diminishing in height and separated by dry or wet dune hollows. In some places there are definite cross-ridges of dunes. In every case these have their western faces bare, a condition caused by the constant erosion of the prevailing westerly winds. From the west end of the island, for a distance of twelve miles, the central strip is occupied by a large salt lake, Wallace Lake. The drifting sand has recently filled up a section of the lake a mile long and divided it into two unequal parts. The farther shore of Wallace Lake is formed by a narrow strip of sand, the South Beach. Near the eastern end of Wallace Lake there are a few dunes on the South Beach, the only remnants of the protecting ridge of dunes that

used to run the whole length of that beach. In the larger dune hollows are fresh-water ponds, and near the shores, and especially at the eastern end of Wallace Lake, are series of brackish ponds. The dunes, especially those near the sea, and the pond shores are well covered with vegetation. The beach grass forms a thin covering over all but the most recent dunes and flats, but there are great stretches, especially near the East End, where the blown sand is beyond control, drifting over everything and forming a barren desert of shifting white sand. This is a bird's-eye view of Sable Island as it was in 1913, but we know from trustworthy records that many changes had taken place and that previously it was very different, at least in size.

Early History of Sable Island.

Who was the first of the European voyagers to sight Sable Island, we cannot now say. It is certain, though, that at the beginning of the 16th century, the fishermen of western Europe were acquainted with it.[1] "This is shown by maps of the period. One preserved in the royal library at Munich, marked as made by Pedro Reinel, who is described by Herrera as 'a portuguese pilot of much fame,' and supposed to be of about the year 1505, has it under the name of Santa Cruz.

"On the 13th March, 1521, the King of Portugal granted to Joan Alvarez Fagundez a large territory embracing Nova Scotia and adjacencies, together with various islands lying off it, which he is said to have discovered on a previous voyage, and among them is Santa Cruz."

"Gastaldi, a distinguished Italian cartographer, in a map of 1548, represents it under the name Isolla del Arena, and he is followed by his countryman, Zaltieri in 1566. But as early as 1546 Joannes Freire, a Portuguese mapmaker, calls it I. de Sable, * * * and by the end of that period it seems to have been commonly known by that name."

This is no place to give a detailed history of Sable Island; consequently only the more important facts, especially those bearing on its physiography or natural history, will be mentioned.

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[1] Much of this historical data has been freely drawn from Patterson, Rev. George: Sable Island: Its History and Phenomena. Trans. Roy. Soc. Can. xii. §2. 3–49 (1894).

Many of the early voyagers refer to the herds of cattle to be found on the island, and there is a great deal of conflicting evidence as to how and when they got there. According to Champlain, they were left there about the year 1552 by the Portuguese. "Not only does Champlain mention the fact, but we find the same asserted by the historian of Sir Humphrey Gilbert's expedition. That intrepid mariner sailed from Newfoundland in 1583 for the American coast intending, after making Cape Breton, to go to Sable Island, as the writer says, 'upon intelligence we had of a Portugal who was himself present when the Portugals, above thirty years past,' consequently before 1553, 'did put into the same island neat and swine to breed, which were since exceedingly multiplied.' Eight days after sailing from Newfoundland, or early in the morning of the 29th of August the largest ship of the three in the fleet, the 'Admiral' of 120 tons, with Maurice Browne, captain, and Richard Clarke, master, first ran among shoals, then stroke aground and had soone after her sterne and hinder partes beaten in peeces'."[1] It has been generally interpreted as by Brymner[2] that this happened on Sable Island. There are two accounts of the event, one by Clarke, a relation of Richard Clarke, the master of the *Admiral*, the other by Hayes, captain and owner of the *Golden Hinde*. These contradictory accounts are both given by Hakluyt. All of the evidence has been reviewed by Patterson[3] who concludes that the wreck of the *Admiral* could not have taken place upon Sable Island and that it probably occured upon Cape Breton, near Louisbourg.

"The island[1] and the cattle upon it next come into notice by the expedition of Troilus du Mesgouez, Marquis de la Roche. He was a Catholic nobleman of Brittany, who had from his youth been connected with the French court. He agreed with the King to found a colony in America, and for that purpose received from him a commission in which he was named lieutenant-general of Canada, Hochelaga, Newfoundland, Labrador, and the countries adjacent, with sovereign power over this vast domain. This commission was first

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[1] Patterson, *l. c.* 8.

[2] Brymner, Douglas: Rept. on Canadian Archives, pp. xxv–xxvii (1895).

[3] Patterson, Rev. George: Termination of Sir Humphrey Gilbert's Expedition. Trans. Roy. Soc. Can. 2nd ser. iii. part 2, 113–27, 2 illustr. and 1 chart (1897).

issued in 1578.'' Biggar tells us[1] that "he did not set sail until 1584. Unfortunately his largest vessel with over one hundred colonists on board was wrecked near Brouague and the voyage had to be abandoned."

"In that year [1598] he set out with one small vessel, under Chef d'hôtel, a distinguished Norman pilot. * * * His expedition was so modest, not to say cheap, in its proportion and equipment as to seem quite unworthy of its ambitious mission, or the vice-regal rank of its commander. One vessel constituted the fleet, and it is so small, that, according to a contemporary chronicle, you could wash your hands in the water without leaving the deck, while forty out of the sixty men comprising the marquis' army of occupation and evangelization, were convicts chosen from the royal prisons."[2]

Biggar, who has investigated many of the old archives, gives us a somewhat different account. He quotes the contract made in March, 1597, between la Roche and Chefdostel, master of the *La Catherine* of 170 tons. Chefdostel was to transport a company of soldiers to Sable Island on condition that la Roche should pay for half the cargo of salt, half the wages of the crew, and the whole of the provisions. A year later la Roche, failing to attract *bona fide* colonists, was allowed to take convicts from the jails of Brittany and Normandy. On the 16th of March, 1598, la Roche made a new contract with Chefdostel who for 600 crowns was to transport the convicts to Sable Island. Two days later a similar contract was made with Jehan Girot, master of the *Françoise,* who having a smaller vessel was to receive 100 crowns.

The Marquis de la Roche obtained 200 or 250 convicts, male and female, from the prisons, but it appears that he allowed many of these to purchase their freedom before sailing. He set sail in 1598 and on reaching Sable Island landed 40, 50, or 60 of the convicts,[3] leaving with them a small supply of provisions and goods; then he sailed away to

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[1] Biggar, H. P.: The Early Trading Companies of New France, 39 (1901).

[2] Oxley, J. M.: Mag. of Amer. Hist. xv. 166 (1886).

[3] Charlevoix, P. F. X.: Histoire et Description de la Nouvelle France, i. 109 (1744), says 40 convicts were landed; Gosselin, E.: Early French Voyages to Newfoundland, Mag. Am. Hist. viii. 288 (1882), says that the colonists "with the exception of fifty, refused to disembark, and compelled de la Roche to bring them back to France"; Biggar, H. P.: The Early Trading Companies of New France, 40 (1901), says that only sixty persons were actually landed on the island.

explore the neighboring coast of Acadia. He intended "to select a site for settlement, to which he proposed afterwards to remove them. On his return he was caught by a tempest, which drove him eastward. His frail bark was obliged to run before the storm, and at last he reached France, intending soon to return. But misfortune attended him. The Duc de Moncoeur is said to have cast him into prison. At all events five years elapsed before anything could be done for the relief of the unfortunate creatures he had left behind."[1]

"At first it would seem as if on being thus released from all restraint they fought with one another like entrapped rats, for Les-carbot tells that 'ces gens se mutinèrent, et se coupèrent la gorge l'un à l'autre'. Then as the horror of their situation fully dawned upon them, and they realized that only by harmonious co-operation could any life be preserved, better counsels prevailed, and systematic efforts were put forth to secure a maintenance. From the wreck of a Spanish ship they built themselves huts, the ocean furnished them with fire-wood, the wild cattle with meat, the seals with clothing, and with some seeds and farming implements happily included among the '*bagage*' mentioned by Les-carbot, they carried on agricultural operations in a sheltered valley by the lake-side whose tradition remains to this day by the locality being known as the French Gardens.

"Despite these alleviations in the rigor of their fate, however, the utter absence of the most necessary comforts, and their own evil deeds so reduced their numbers that when, in 1603, the King sent a vessel [under Chef d'hôtel, the same pilot] to bring them back, only eleven out of the original forty were found alive, clad in their self-made seal-skin garments, broken, haggard, and unkempt, they were presented before Henry IV., and their harrowing tale so touched the royal heart that they each received a full pardon for their crimes, and a *solatium* of fifty golden crowns. The strangest part of the story remains yet to be told. Undeterred by an experience that was surely sufficient to appall the stoutest hearted, these Rip Van Winkles of the sea, whose names may still be found in record in the *Registres d' Audience du Parliament de Rouen*, returned to their place of exile, and drove a thriving trade in furs and ivory with their mother country for many years, until one by one they passed away."[2]

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[1] Patterson, *l. c.* 8.

[2] Oxley, *l. c.* 167.

From Governor John Winthrop's Journal[1] we learn that "Mr. John Rose, being cast ashore there in the [*Mary and Jane*] two years since [1633], and making a small pinnace of the wreck of his ship, sailed thence to the French upon the main, being thirty leagues off, by whom he was detained prisoner, and forced to pilot them to the island, where they had great store of sea-horse and cattle, and black foxes; and they left seventeen men upon the island to inhabit it. The island is thirty miles long, two miles broad in most places, a mere sand, yet full of fresh water in ponds, etc. He saw about eight hundred cattle, small and great, all red, and the largest he ever saw, and many foxes whereof some perfect black. There is no wood upon it, but store of wild peas and flags by the ponds, and grass. In the middle of it is a pond of salt water, ten miles long, full of plaice etc."

"In 1634 the island was granted, along with Port Royal and La Heve, by the Company of the Hundred Associates, to Claude de Razilli, brother of Isaac de Razilli, who had been appointed commander or governor-in-chief of Acadia, and who had commenced a settlement at La Heve."[2]

In the following year, 1635, according to Governor John Winthrop[1], "Mr. Graves, in the James, and Mr. Hodges, in the Rebecka, set sail for the Isle of Sable for sea horse (which are there in great number) and wild cows. * * * The company which went now, carried twelve landmen, two mastiffs, a house and a shallop.

"[August 26.] They returned from their voyage. They found there upon the island sixteen Frenchmen, who had wintered there, and built a little fort, and killed some black foxes. They had killed also many of the cattle, so as they found not above one hundred and forty, and but two or three calves. They could kill but few sea-horse, by reason they were forced to travel so far in the sand as they were too weak to stick them, and they came away at such time as they [the sea-horse or walrus] use to go up highest to eat green peas. The winter there is very cold, and the snow above knee deep."

Commander de Razilli died that year or the next, and his brother transferred the rights of both to Charnisay, and the French seem to have abandoned the island.

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[1] Winthrop, John: The History of New England from 1630 to 1649, edited by James Savage, i. 162 (1825).

[2] Patterson, George: Supplementary Notes on Sable Island. Trans. Roy. Soc. Can. 2nd series, iii. § 2, 133 (1897).

Governor Winthrop also records[1] that in the summer of 1642 "the merchants of Boston sent out a vessel again to the isle of Sable, with 12 men, to stay there a year. They sent again in the 8th month, and in three weeks the vessel returned and brought home 400 pair of sea horse teeth, which were esteemed worth £300, and left all the men well and 12 tons of oil and many skins, which they could not bring away, being put from the island in a storm."

In the 4th month of 1642, "the adventurers to the Isle of Sable fetched off their men and goods all safe. The oil, teeth seal and horse hides, and some black fox skins came near to £1500."[2]

As we learn from a letter by Bishop Saint Vallier, written in 1686, the Acadians caught and shipped large numbers of the wild cattle to their homes on the mainland, where they domesticated them. We do not find the wild cattle mentioned after this time.

During the early part of the 18th century we hear very little of Sable Island. It was next brought into prominence by the Rev. Andrew Le Mercier, a graduate of Geneva and of old Huguenot stock, who, in 1719, became pastor of the French Protestant Church in Boston. In 1729, on the arrival of Governor Phillips in Nova Scotia, Le Mercier proposed to him to plant a colony of French Protestants in Nova Scotia. The Governor recommended a grant of 5,000 acres, but nothing came of it. On the 6th of March, 1738, we find Le Mercier petitioning[3] Governor Armstrong for a grant of Sable Island, but after approval of his petition, he was unwilling to pay the penny an acre quit-rent. At this time, Le Mercier sent stock to the island preparatory to moving his family there. In 1740, he again applied for a grant of the island arguing[4] that as the land is "low, boggy and sandy soil, with large ponds or settlings of water occasioned by the overflowings of the tides, he thinks the penny an acre too much for what can not be improved."

At the instance of Le Mercier, the Governor of Nova Scotia issued two proclamations forbidding any molestation of Le Mercier's establishment on Sable Island. Nevertheless, he suffered losses and advertised in a Boston paper[5], in 1744, a reward of £40 for the detection

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[1] Winthrop, *l. c.* ii. 34.
[2] Winthrop, *l. c.* 67.
[3] Murdoch, Beamish: Hist. of Nova Scotia, i. 523 (1865).
[4] *Ibid.*, ii. 6 (1866).
[5] Boston Evening-Post, Jan. 30 (1744).

of the plunderers, saying, "Notwithstanding those two Proclamations, the *love of Money*, which is the *Root of all Evil*, is so deeply rooted in the Hearts of some Fishermen, that they have sundry Times Stole our Cattle and our Goods, regarding neither the Laws of God or of Man, neither Justice to me, or Humanity to Shipwreck'd Men, which by their Wickedness they endeavor to Starve, and minding neither natural or revealed Religion and their eternal Damnation, nor even their own temporal Interest, which is certainly not to hinder but to promote the abovesaid Settlement, since it may be their Case one Time or other to be cast away upon the Island *Sables*, and to want there those Things which they have carried off."

In the year 1746, the Duc d' Anville, in his expedition against the British colonies, was overtaken by a severe storm near this island and lost a transport and a fire-ship.

In 1753, Le Mercier published a detailed notice of Sable Island.[1] It is really an advertisement, by means of which he hoped to sell the island, so we must understand and discount the very rosy light in which it is portrayed. As the article is of very considerable interest, and as it is not readily available to all readers, it seems worth while to quote it here in its entirety.

"TO BE SOLD by me the Subscriber

"(Andrew Le Mercier, Pastor of the French Church)

"THE ISLAND *Sables*.

"*The Publick hath here a short description of it for nothing.*

"SAID Island is situated at the Distance of about 40 Leagues from *Halifax*, thirty from *Cape Breton*, and 50 from *Newfoundland;* a good Market for the Produce of the Island, Cattle & Roots of all sorts. It is about 28 Miles long, one Mile over, and contains about 10,000 Acres of Land, 500 of which are quite barren, all the rest produces or may bear something. Their are neither River or Brooks or fresh Water, but everywhere even upon the Beach you may come to fresh clear Water by digging about 3 feet, by which means the root of the Grass is always kept cool and alive, so that it cannot be much subject to a Drought, as it was experienced three Years ago. The Climate may be called temperate, for as in Winter the Snow hardly lies above three

[1] Le Mercier, Andrew: The Island Sables. Boston Weekly News Letter, February 8 (1753).

Days on the Ground, so it is never extream hot in Summer, and it is a rare thing to be frightened by any Thunder. It bears no venomous Creatures of any sort, and hardly any Flies.—The high Winds clear the air, which makes it healthy; and nature hath furnished it with medicinal Plants and Shrubs:—It produces naturally near 20 sorts of Berries, out of which some People suppose very good Liquors and Wines might be expressed— It looks all green in Winter with the Juniper Bushes and red in Summer with the large Strawberries and other wild Fruits which it bears.—It hath abundance of wild or Beach Pease, which fatten the Cattle very well:—By several Pieces of petrified Wood found there it is supposed that the Sand hath a Property of petrifying Wood.—Within these seven or eight Years Providence hath opened a Communication between the great Pond (fifteen Miles long) and the Sea, which hath made a safe and large Harbour, but the Entrance is barred so that large and sharp Vessels cannot get into it; but as there is about 8 Feet of Water over the Bar at high Water there is sufficient Passage (as we know by Experience) for Vessels of 30 Tuns or more, if not built Sharp.—The Ponds abound with Flounders and Eels; the Beech itself with Clams and Sand Eels; the Air with Fowls, and especially with black Ducks, so as to make money with their Feathers. The Soil is so natural for all sorts of Roots, especially Turnipe, that they are not only uncommonly sweet there but also uncommonly large, some weighing 7 Pounds a piece:—Rye grows there very naturally and also Wheat at the Rate of 13 Bushels per acre. It is supposed that Flax would grow there very well; it would also produce Indian Corn well enough if the high Winds in the Fall did not break it:—There is neither Trees (but many Bushes) nor Stones.—The Grass is tall, thick and hath a very sweet taste and nourishing Property; there is some English Grass, but the other is more profitable, and there is enough to feed some thousand Heads of Cattle:—Horses breed and grow there without Care or Trouble; there is all Winter long Grass enough or near enough for them, so that they eat but little of the Hay which is made for them in the Summer or the Fall.—The raising of Sheep, Horn-Cattle, and especially of Horses is the most Advantagious (as for the Grain there are not above 400 Acres where it may be raised). The Care of Gardens and Cattle take up our People's Time in Summer, in Winter they go to kill Seils and boil their Fat into Oyl, as well as that of Whales, which now and then are cast away dead upon the Beach. The Island finds them in

Turf and the Sea brings them Wood; so they are not deprived of the Necessaries of Life, nor without Profits of several Sorts; besides their having the pleasure of saving many Men's Lives, according to the motto of the Island, viz—*Destruo* & *Salvo*. When I took Possession of the Island there was no four-footed Creatures upon it, but a few foxes some red and some black (some of which remain to this Day) now there are I suppose about 90 Sheep, between 20 or 30 Horses including Colts, Stallions and breeding Mares, about 30 or 40 Cows tame and Wild, and 40 Hogs. There are all sorts of Utensils for Farming and trying Fat, several Boats and six or seven small Houses and Warehouses. The advantages which do acrue or may acrue from the Improvement of that Place are so great that I would not easily part with it if I was so skilful in Navigation and Shipping as is necessary: That Ignorance of mine induces me (not any Defect in the Island itself) to part with it. If any Person desires to purchase it, and to know further about it, they may see at my House a Map and Plan of it, or if they live at a Distance by letters sent (Postage free) they may enquire about any Thing, they want to be satisfied in, and I will endeavor to give them all the Light they desire. I must know their Mind within 2 or 3 Months, that the Crew now upon the Island, may be disposed of accordingly."

"*Boston, the 5th Day of*
"*February, 1753*

Andrew Le Mercier,
Pastor of the French Church."

It does not appear that Le Mercier found a purchaser. He died on March 31st, 1764, and his will, drawn on the 7th of November, 1761, does not mention Sable Island. At least in 1760, the island was uninhabited and a certain Boston merchant, Thomas Hancock[1], desiring to relieve the sufferings of those shipwrecked, fitted out a schooner with "Horses, Cows, Sheep, Goats, Hogs and Animals likely to live on the Island. They were landed there and generally answered very well."

In 1760, a vessel with a part of the 43d regiment, returning from the capture of Quebec, was wrecked on the island. The evidence of this was found long afterward. "In the year 1842, during a severe gale, an old landmark in the form of a pyramid, said to be one hundred feet high, was completely blown away, exposing some small huts built of the timbers and planks of a vessel. On examination they were found to contain quite a number of articles of furniture, stores

[1] Rept. on Canadian Archives, 86 (1895).

put in boxes, bales of blankets, a quantity of military shoes, and, among other articles, a dog-collar of brass, on which was engraved the name of Major Elliott, 43rd regiment. On referring to the records of the regiment, however, it was found that the party had been taken off the island. The site of the encampment is now under at least five fathoms of water."[1]

In 1774, permission was granted by Governor Legge, and approved by the King, to Michael Flannigan and his associates to reside on the island.[2] We know nothing of their intentions or the length of their stay.

During the War of the American Revolution, American privateers frequently visited Sable Island and made great inroads on all its resources. By the close of the hostilities none of the animals remained, except a few of the horses.

Moses Gerrish, a Newburyport skipper, was shipwrecked on Sable Island on a homeward voyage from the Banks, November 9, 1787. The provisions which he and his crew saved, and a number of young seal lasted them about 60 days when they "had recourse to the horses * * * * we killed and eat 13 of them. * * * Being without ammunition, we were obliged to dig pits to betray horses, it being impossible to get them in any other way."[3] He was rescued on the 18th of April by Capt. Nathaniel Preble of the schooner *Betsy*.

In the year 1789, a certain Jesse Lawrence. "who lived on the isle of Sable, to receive wrecked people, and to carry on the seal fishery, was attacked by people from Massachusetts, who landed there and wantonly pillaged and destroyed his house and effects, and then compelled him to leave the island. He received some compensation from Governor Hancock [of Massachusetts] and his council, which still left him a sufferer."[4]

During the last few years of the 18th century, Sable Island was the scene of many disastrous shipwrecks, and at this time objects of great value and foreign origin, laces, jewelry, etc., were seen in the cabins of certain Nova-Scotian fishermen, and ugly tales were told about wreck-

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[1] Patterson, George: Sable Island. Trans. Roy. Soc. Can. xii. § 2, 11–12 (1894).

[2] Murdoch, Beamish: Hist. of Nova-Scotia, ii. 526 (1866).

[3] Essex Journal and New Hampshire Packet (1788); and Boston Herald and Journal, December 28 (1917).

[4] Murdoch, *l. c.* iii. 78 (1867); and Nova Scotia Gazette, February 10 (1789).

ers and pirates preying on any unfortunates cast upon the island. So notorious was this condition, that at the instance of Sir John Wentworth an act was passed in 1801 for the protection of shipwrecked property; and unauthorized persons were forbidden to dwell on Sable Island, and were forcibly removed.

The captain and the crew of one of the vessels cast away at this time were forced to stay on Sable Island through the winter. It became the Captain's custom after each storm to examine the part of the island most affected by it. In doing this he counted over 40 wrecks, which had been uncovered, not one of which was visible before.

First Humane Establishment, 1801.

On the 25th of June, 1801, the House of Assembly of Nova Scotia authorized the settling of three families on Sable Island and voted £600 to defray the expenses. James Morris was appointed the first Superintendent, and on the 13th of October, he with his family and assistants was landed on the island. The object was to save the lives and the property of people shipwrecked on the island. Three years later, by an official report, we learn that from five wrecks, Supt. Morris and his staff were responsible for saving the lives of 41 persons and £2,300 worth of property.

Between 1801 and 1913, there have been 176 known wrecks on the Island, and it is estimated from bits of wreckage that at least as many "missing ships" have struck and gone down with all hands on the more distant parts of the bars. The Northwest Bar extends 11 miles beyond the West End of the island and the Northeast Bar 16 miles beyond the East End, so that in time of storms the island and its bars form a line of breakers and shoals nearly 50 miles long that bodes ill for any mariner who attempts to cross.

During the War of 1812, President Madison issued strict orders that "the public and private armed vessels of the United States are not to interrupt any British unarmed vessels bound to Sable Island, and laden with supplies for the humane establishment at that place."[1]

The establishment has continued to the present day, supported at first by the government of Nova Scotia, then by Nova Scotia and Great Britain jointly, and now by Canada and Great Britain. In 1913, it consisted of five Life Saving Stations and two lighthouses, with a staff of twenty-one men, and a Marconi Station with five men, the

[1] Niles' Weekly Register, iii. 191 (1812).

total population including the families being about sixty persons. In the records of this establishment we have continuous detailed information as to the conditions on Sable Island.

Diminishing Size of Sable Island.

We find Sable Island represented on the early charts of the coast of North America such as that by Reinel, in 1505, by Rotz in 1542, by Joannes Freire in 1546, by Vaz Dourado in 1573, and by that of Hakluyt in 1598-1600. It also appears on the small-scale maps by Philippe Buache in 1736, and that by Bellin in 1757.

In 1766 and 1767, Joseph Frederick Wallet Des Barres made a survey of Sable Island, published[1] in 1777 and 1779. It is drawn on two different scales, the larger about one-half a mile to the inch. He gives several hundred soundings near the island and locates it between 60° 01′ and 60° 32′ W. Long. The island itself is shown as a long flat crescent, in shape much as it is to-day, and 30 miles long by 2 miles broad. The second highest hill is 146 feet above sea level. The center of the island is shown with an inland lake 12 feet in depth, with an opening to the sea on the north side. Almost continuous ridges of dunes shelter this lake on both the north and the south sides. Des Barres says, "The whole island is composed of fine white sand, much coarser than any of the soundings about it, and inter-mixed with small transparent stones. Its face is very broken, and hove up in little hills, knobs and cliffs, wildly heaped together, within which are hollows and ponds of fresh water, * * * . The *Ram's Head* is the highest hill on this island; it has a steep cliff on the north west and falls gently to the south east. The *Naked Sand Hills* are one hundred and forty-six feet of perpendicular height above the level of high-water mark, * * * * * Gratia Hill is a knob at the top of a cliff the height of which is one hundred and twenty-six feet * * *."[2]

Of this same period is a chart by Capt. John Montresor: Map of Nova Scotia or Acadia; with the Islands of Cape Breton and St. John's, from Actual Surveys, by Capt. Montresor, 1768. The scale is about 6 miles to the inch. Sable Island is shown as 30 2/3 miles in length by 2 miles in breadth. The salt lake has an opening at its western end through the South Beach. The dunes extend half-way

[1] Atlantic Neptune, i (1777 and 1779).

[2] Des Barres, *l. c.* 68.

down the South Beach, but the remainder is shown as a mere sand flat. There is no detail as to the fresh-water ponds or the individual dunes.

Another British Admiralty chart of Sable Island, dated 1770, appeared as Chart 8 in Robert Sayer's North American Pilot of 1779. These charts were drawn from original surveys by James Cook, Michael Lane, Surveyors, Joseph Gilbert, and other officers in the King's Service, and they were engraved by Thomas Jeffreys, and printed by R. Sayer and J. Bennett. Although this Sayer chart was, like the Des Barres chart, an official British Admiralty chart and was published in a volume of the same year as the second issue of the Des Barres chart, and although there is no indication of the identity of the surveyor of the Sayer chart, yet the two charts were undoubtedly based on two distinct and independent surveys. The Sayer chart is on the scale about 3 miles to the inch. The outline of the island is the same flat crescent, like that shown by Des Barres, and the length is "about 30 Miles, in Breadth across the Pond, Meadow and upland a Mile;" but the details are quite different. There is no indication of the height of the sand dunes, and the local place-names differ. The opening from the salt lake through the North Ridge has been drifted over and appears as a sand flat, marked, "The Place to Dig for a Harbour." Instead there is an opening through the South Beach at the western end of the salt lake. The South Beach is shown with a line of dunes running for six miles from the east end, then for the rest of its length it is shown as a mere sand flat with a few remnants of dunes. This chart lacks the detail of the location of the fresh-water ponds and the numerous ridges of dunes such as appears on the Des Barres chart.

Superintendent James Morris, in 1801, estimated one hill at the east end to be 200 feet high and others to be 150 feet high.

Lieut. Burton, in 1808, made a survey of the island when it was proposed to place a lighthouse there. He reported the island to be 30 miles in length and 2 miles in breadth, with hills from 150 to 200 feet, beginning at the west end, and attaining their greatest elevation at Mount Knight, its eastern extremity.

When, in 1802, the position for the main station was chosen, it was one remarkably sheltered among the sand hills, 5 miles from the West End.

"In 1814 the Superintendent, Mr. Hudson, wrote the Government, that owing to the rapid manner in which the island was being washed

away it would be necessary for him to remove the establishment to a more secure position; that within 4 years previous, 4 miles had gone entirely from the west end, leaving but a mile between him and the sea which was advancing steadily. On the north side an area equal to 4,0 ft. wide and 3 miles long had gone bodily from the island during a single night. He intended to move the buildings to a place called 'Middle Houses', 3 miles further east.

"In 1820 the Superintendent again wrote the Government, that not only had the old site of the main station gone seaward; but the sea was again encroaching to such an alarming extent that he would be obliged to once more remove the station, and had selected a place known as the 'Haul over,' 4 miles further east. Here it enjoyed a short respite when again the sea threatened its foundation. * * * again the sea advanced, the two following winters were noted for the frequency of storms, and the havoc made along the sand cliffs, every gale sensibly diminishing the western portion of the island, toppling great masses of sand hills into the surf below as well as changing the surface of the interior. One instance * * * when thousands of tons of sand were carried from the beach and strewn over the island, smothering vegetation, so that hundreds of horses died for want of food."[1]

It has been argued by J. B. Gilpin[2], and following him by Prof. John Macoun[3], that the action of the wind is here always constructive, that it takes the sand from the dry upper beach, moves it inland and builds it up into the dunes, but that it does not act as a waster. It does build up, of course, but on the lee side it is also picking up the sand grains and carrying them out over the sea, where at the slightest lull they drop into the water, and are lost, as far as Sable Island is concerned. That the wind is constantly shifting the sand in whatever direction the wind happens to blow, is forcibly brought to the attention of anyone who ventures out of doors in a strong wind. If the wind is blowing 20 miles an hour or more, it picks up so much sand that it acts like a veritable sand-blast. In consequence all the lights of glass in the windows become quickly dulled and soon so abraded that they are no longer transparent but only translucent. Any traveller feels it and is forced to shield his eyes, face, and hands from its severe action.

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[1] Macdonald, S. D.: Trans. N. S. Inst. Nat. Sci. vi. part 2, 113 (1884).
[2] Gilpin, J. B.: Sable Island, 19 (1858).
[3] Ann. Rep. Geol. Surv. Can. n. s. xii. 213A (1899).

As stated, this shifting of the sand often completely buries the vegetation of considerable areas. This is indicated by the layers of dark peat usually less than an inch in thickness that may be seen in vertical sections of the dunes such as are often exposed when the wind opens a new gulch. In 1913, two of the Life Saving Stations, no. 2 and no. 4, were seriously threatened with being buried by the shifting sand. Both were situated near and in the lee of the North Ridge, the high and nearly continuous line of grass-covered dunes that skirts the crest of the North Beach. In each case the wind had made a break and opened a gulch in the North Ridge opposite the stations. Every north wind enlarged the two gulches and piled the sand, tons of it, around the two stations. The necessity of moving these stations was seriously being considered.

The old main station-house was again moved, two miles farther east. When the sea later undermined the new foundation, it took the old house too.

A chart of Sable Island by Capt. Joseph Darby was published in 1824 and revised in 1829. It is on the scale of 3 miles to the inch. The island is shown as 25 ⅓ miles long, and the South Beach is shown with an almost continuous line of dunes. Wallace Lake appears 15 miles in length, and with the dunes extending 2 miles beyond its western end.

Capt. Darby reports in Blunt's Coast Pilot of 1832, "I have known this island for 28 years, during which time the west end has decreased in length 7 miles, although the outer breakers of the N. W. bar have the same bearings from the west end of the Island as they formerly had, demonstrating that the whole bank and bar are travelling eastward."

Mr. Miller, in 1833, selected a site for a lighthouse, but in 1837, on revisiting it, he found that it had undergone a complete change and he was forced to recommend a temporary site and a lighthouse such as could be easily removed.

A severe gale in 1842, completely demolished an old landmark, a pyramidal hill near the west-end station said to be 100 feet in height. Under this were found relics left by Maj. Elliott and men of the 43d Regiment, wrecked here in 1761.

The Hon. Joseph Howe visited the island as Commissioner in 1851. In his report is the startling statement that during 30 years, 11 miles by actual measurement of the western end had been washed away.

At this time, 1851, Capt. H. W. Bayfield[1] made another survey of Sable Island and the bank about it. He determined the position of the East and West Ends as 59° 45′ 59″ W. long., and 60°8′57″W. long. "The east extreme of the sand hills alone remains unchanged for comparison with the observations of Admiral Ogle's officers [in 1828], and it is satisfactory to find, that there was not only no reason to find fault with their determination, but that their latitude and also the meridian distance from Halifax is the same as ours, within two or three seconds of space. About two miles of the west end of the Island have been washed away since they observed in 1828, and this reduction of the Island, and consequent addition to the western bar is reported to have been in operation at least since 1811, and seems almost certain to continue. A comparison some years hence with the present survey, can alone show precisely the amount of waste in any given time, the correctness or otherwise of the reported shifting of the bars, and of the opinion that the Island is insensibly becoming narrower, &c. All agree that there has been no material change in the east end of the Island within the memory of anyone acquainted with it, * * *."

For the next twenty years the island enjoyed a period of comparative stability and calm.

The winter of 1881–82, was marked by a succession of severe gales in which great erosion took place. The winds wasted from the surface of the dunes and the waves chopped off whole sections from the end of the island. During one gale an area of 70 feet by one-quarter mile vanished, as a month later in a few hours did 33 feet of the whole breadth of the island. Early in February occurred another violent gale, this time coincident with a high run of tides. The sea had worn away the embankment of dunes to within forty feet of a bluff on which stood the light-keeper's barn. All hands stood by. The cattle were removed to the porch of the lighthouse. As the staff were watching the force of the waves that were undermining the embankment, suddenly they saw a depression in the margin of the cliff, and the next instant an area equal to 48 feet wide and one-quarter mile long vanished into the breakers on the north side. During the night the forty feet in front of the barn vanished, and the next morning the barn itself went crashing down into the waves.

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[1] Bayfield, Capt. H. W.: Append. to Journ. of House of Assembly, Prov. of N. S. no. 24, 167–168 (1851).

The sea was now within 12 feet of the West Lighthouse, a splendid tower built in 1873 at a cost of $40,000. During two days of unusually quiet weather, a heavy ground-swell set in from the southeast undermining the embankment till the lighthouse canted over dangerously. Before the crash the apparatus was removed. Later it was installed about a mile further east. The sea continued to advance and in 1888 the light was again removed, two miles farther east.

From this time, another period of comparative stability started. It will be seen that such has been the regular course of events: during a few years every storm causes violent destruction of a part of the island, then follows a period of 10, 20, or 40 years of quiet. This is probably to be explained by the protecting action of the sand washed from the island and deposited on the surrounding bars during the years of active erosion. The building-up of these bars makes a protecting ring upon which the waves break their fury before reaching the island. When these bars have been worn down the waves can again vigorously attack the island, and another period of destruction ensues.

We have no more recent survey, but only the observations of those stationed on the island, which tell us that it is now twenty miles long, less than one mile broad, and its highest point, Rigging Hill, nearly 100 feet high.

Changes in Wallace Lake.

The physical changes in Sable Island are also evidenced in Wallace Lake, the great salt-water pond that occupies the center of the island for over half its length.

Le Mercier gives us our first good account[1] of this lake, in the year 1753. "Within these seven or eight Years, Providence hath opened a Communication between the great Pond (fifteen Miles long) and the Sea, which hath made a safe and large Harbour; but the Entrance is barred so that large and sharp Vessels cannot get into it; but as there is about 8 Feet of Water over the Bar at high Water there is sufficient Passage (as we know by Experience) for Vessels of 30 Tuns or more, if not built Sharp."

On Des Barres' chart from the survey of 1766 and 1767 the lake is shown very much as at present, but with a broad opening to the sea through the dunes on the north side, with soundings in its center of

[1] Boston Weekly News Letter, February 8 (1753).

12 feet, and with a total length of 12 miles. Beyond its western end the sand dunes stretched continuously for about 5 miles. The South Beach was half a mile in width and had an almost continuous line of dunes 50 feet in height. In 1808, Superintendent James Morris writes of this channel, "It is completely shut, and it is difficult to trace where it has been." In 1828, Superintendent Edward Hodgson refers to this obliterated channel, urging that it be reopened. Some years afterward a terrific storm made a breach in the South Beach, again opening the salt pond to the sea, and making it available as a harbor for small vessels. In 1836, during a severe storm two American fishermen ran into this protected harbor for shelter, but the storm completely blocked up the channel, imprisoning the vessels, whose weathered timbers now lie on the shores of Wallace Lake. One of the gales in the winter of 1881 opened a gulch toward the eastern end, which so drained the lake as to reduce it to 8 miles in length, and rendered it so shallow as to be no longer useful in transporting materials from one Life Saving Station to another. This gulch is now closed, and all the dunes beyond the western end of the lake have been washed away, only a narrow beach now separating the lake at this point from the sea. The waves have eaten off almost all of the South Beach, all of the line of dunes is gone except a small remnant near the eastern end, and the beach itself is so narrow now, that waves break over it in heavy weather. It is no longer possible to maintain a Life Saving Station on this South Beach. There is usually an opening, now through one or another part of the narrow South Beach. The wind has drifted sand across and filled up a strip, a mile wide in 1913, dividing Wallace Lake into two unequal parts.

If we look back over this evidence and draw a contrast, it is a very striking one, for from various surveys of 1766–67, 1768, 1770, and 1801, the island was about 30 miles long, 1 to 2 miles broad, with hills 150 to 200 feet high; whereas now it is but 20 miles long, hardly 1 mile broad, and the highest hill does not even attain 100 feet.

If the determination of the location of the island in the earlier surveys was correct, the whole island has been moving slowly eastward. The prevailing winds are westerly; the western end of the island is the lower and has suffered all of the severe erosion by wind and storm; and the eastern end is broader, with higher hills, and more drifting unanchored sand. As the bare undercut western side of the cross-ridges of dunes testifies the prevailing westerly winds are the dom-

inant eroding factor on the surface of the island, so that it is quite possible that the whole island is, under the compulsion of these westerly winds, slowly creeping eastward along the summit of the Sable Island Bank.

In any case, the island is rapidly wasting away. Three hundred years from now Sable Island, in all probability, will have vanished, and then there will be no lighthouse to warn the mariners of those times from the treacherous bars on the summit of the Sable Island Bank. The study of its fauna and flora will then be ancient history, only to be pursued by consulting the few specimens in the larger museums and herbaria.

The Endemic Fresh-water Sponge.

An endemic species of fresh-water sponge, *Heteromeyenia macouni* Mac Kay[1] has been described from Sable Island. "This sponge was collected in considerable abundance on the 18th of August, 1899, by Professor John Macoun, Botanist of the Geological Survey of Canada, in the fresh water pond found in the center of that great sand-shoal in the Atlantic Ocean, well known as Sable Island, nearly one hundred miles from Nova Scotia, the nearest part of the continent. It was growing around the submerged portion of the slender stems of *Myriophyllum tenellum*, Bigelow, in green, compact, lobular masses, showing, where broken, numerous orange yellow gemmules.

"It appears to approach most nearly to the following fresh water sponges described by Potts: *Heteromeyenia ryderi v. baleni*, found from Florida to New Jersey, in its spiculation; and *Heteromeyenia ryderi v. walshii*, from Gilder Pond, Massachusetts, in the fasciculation of its skeleton spicules." Gilder Pond is at 1,800 feet altitude on the side of Mt. Everett, Mount Washington, Berkshire County, Massachusetts.[2]

Ipswich Sparrow.

The Ipswich Sparrow, first discovered in 1868 by C. J. Maynard among the sand dunes at Ipswich, has constantly been a source of interest to ornithologists. Repeated observations along the Atlantic seacoast proved it to be a regular migrant starting south from Nova Scotia in September, stopping at the bleak wind-swept areas of sand dunes on its journey to Maine, Virginia or sometimes to Georgia.

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[1] Mac Kay, A. H.: Fresh Water Sponge from Sable Island. Trans. N. S. Inst. Sci. x. 319–322 (1900).

[2] Proc. Acad. Nat. Sci. Philadelphia, 231 (1887).

In the early spring this shy, quiet bird follows the coast northward to its nesting grounds. In 1884, Robert Ridgway[1] suggested that a series cf eggs from Sable Island, collected by J. P. Dodd in July, 1862, might in reality be those of the Ipswich Sparrow.

Immediately Dr. C. Hart Merriam[2] wrote to Rev. W. A. Des Brisay, a resident missionary at Sable Island, and obtained a specimen of the common "Gray Bird" of the Island. The fact that this proved to be an Ipswich Sparrow added another link to the chain of accumulating evidence. It remained for Dr. Jonathan Dwight, Jr., however, actually to determine the breeding-haunts of this large pale-colored sparrow. In 1894, Dr. Dwight visited Sable Island, remaining there from the 28th of May till the 14th of June. During that time he found the Ipswich Sparrow breeding there; he studied its song, its habits; he collected sets of eggs and the cleverly hidden nests; and he learned that some of these "Gray Birds" as they are called by the Life Savers on Sable Island, are all the year residents, though most of them migrate southward in the fall.

Persistent search on the mainland of Nova Scotia, on Cape Breton, on Prince Edward Island, and among the sand hills of the Magdalen Islands has failed to reveal or even hint that the Ipswich Sparrow ever breeds anywhere except on Sable Island.

The bird is so small and so retiring that it has never attracted the notice of the fishermen, hunters, and desperadoes, who for centuries, just how many no one can say, have frequented the island and brought persecution or destruction to one or another kind of animal life. Although neither man nor other living enemies disturb the bird, it does seem seriously threatened by other factors.

Since all of the individuals of this species breed on Sable Island, is there a definite maximum of breeding pairs that can be supported? Of course this must be answered in the affirmative, and on a bleak, sterile island of about fifteen square miles in area, this maximum number cannot be very large and it must now be smaller than in the past when Sable Island was much larger in size. But what of the future, when more and more of the island disappears in the waves, till finally it ceases to exist? Will the Ipswich Sparrow seek a new breeding-ground, or is it a species grown so conservative that it cannot make the change, and will vanish with its island home? The writer makes

[1] Auk, i. 292 (1884).
[2] Auk, i. 390 (1884).

no attempt to answer these questions that he has posed, but leaves them for the reader, or to the observers of future generations.

Native and Introduced Animals.

Most of the early voyagers were drawn to Sable Island because of the animal life, natural or introduced, that existed there. The Portuguese fishermen, about 1520, placed cattle on the island, where they persisted and multiplied greatly.

Johannes de Laet, in 1633, mentions the cattle and swine, as well as seals and black foxes.

The convicts abandoned by Marquis de la Roche in 1598, lived on the cattle and clothed themselves in the skins of the seals.

John Rose of Boston, when shipwrecked on Sable Island in 1633, saw, "about 800 cattle, small and great all red, and the largest he ever saw, and many foxes whereof some perfect black." In the years that followed many parties sailed from Boston to the island to hunt the wild cattle, black fox, and the walrus.

The cattle must have been killed off in the mean time for Andrew Le Mercier says, "When I took Possession of the Island [1738] there was no four-footed creatures upon it, but a few foxes some red and some black (some of which remain to this day) [1753]." From his time on there are frequent mentions of wild horses or ponies on the island, but these we consider elsewhere.

In 1801, with the outfit of the Humane Establishment, there were introduced on the island 1 three-year old bull, 2 young cows in calf, 1 young boar, 2 young sows, 1 male and 1 female goat, 2 rams, 8 ewes, and 1 horse. Superintendent Morris, in 1802, referred to the wild horses, "the only animals found on the island, if we except the rats and mice, which at one time became very troublesome." Of the animals introduced, it was found that the sheep did not thrive, all dying except two pet lambs brought up in the house. Several later attempts were made to maintain them on the island, but though done with care, all were unsuccessful. "The animals seemed to thrive, but one after another would be found dead, though quite fat. The officers in charge of the admiralty survey reported that they found a plant which was fatal to sheep."[1] It has not been possible to determine who made this report, nor to what species it alludes.

The hogs ran wild and soon became quite fierce. They were all destroyed in 1814 because of their ghoulish tastes when shipwrecks occurred.

[1] Patterson, George: Trans. Roy. Soc. Can. xii. § 2, 20 (1894).

English rabbits were introduced, and they multiplied so that they formed an abundant source of food. Then rats escaping from wrecked vessels reached the island and became so numerous as to be a plague, eating up so much of the stores that Superintendent Morris and his men were seriously threatened with starvation. Then the rats by killing the young, nearly annihilated the stock of rabbits. The government sent out a number of cats, which killed the rats, and then finished the rabbits. The cats soon became very wild and so numerous as to be troublesome. Dogs were then imported, and they, helped by men with shot-guns, finished the cats. Rabbits were again introduced and throve, until they were discovered by a snowy owl. The owls soon came in numbers to this happy hunting-ground, and they finished the rabbits. In 1882, rabbits were again introduced, and the story is almost parallel with the foregoing. They multiplied and became such a nuisance that in 1889, seven cats were brought from Halifax, and in 1890, thirty more. While the cats were wintering and fattening on the rabbits, seven red foxes were brought from the mainland and in a single season they made an end of all the rabbits and cats. These records show in a very graphic way what happens when an additional species of animal is introduced on a small island, what a severe struggle for existence takes place between it and the species already there.

Sable Island Ponies.

From nearly every recent voyager to Sable Island, we get accounts of more or less fullness about the wild ponies, but we must turn to J. Bernard Gilpin[1] for the best record. He assumes that the present gangs of Sable Island ponies are the descendants of a few horses of ordinary New England stock landed there by the Rev. Andrew Le Mercier about one hundred and fifty years before [1714]. This approximate date is earlier than Le Mercier's actual connection with the island, for[2] "on the 6th of March, 1738, he wrote to Governor Armstrong [of Nova Scotia], inclosing a petition for a grant of it, on behalf of himself and his associates. His design was stated as being to stock it with such domestic animals as might be useful in preserving the lives of mariners who might escape from shipwrecks; though,

[1] Gilpin, J. Bernard: On Introduced Species of Nova Scotia. Trans N. S. Inst. Nat. Sci. i. part 2. 60 (1864).

[2] Patterson, George: Sable Island: Its History and Phenomena. Trans. Roy. Soc. Can. xii. § 2. 11 (1894).

from the suitableness of much of the soil for grazing and the opportunities afforded for seal hunting, they no doubt hoped to combine profit with benevolence. The petition was approved, but the grant does not seem to have actually passed. He was unwilling to pay the penny an acre quit rent demanded by the instructions of his majesty's government. * * * in the mean time Mr. M. sent a stock of cattle to the island, preparatory to removing his family thither.

"In 1740 he again applies for a grant of the island, but represents that as the land is, 'low, boggy and sandy soil, with large ponds or settlings of water occasioned by the overflowing of the tides, he thinks the penny an acre, too much for what cannot be improved.' On the 16th August Governor Mascarene writes to the board of trade that it would be to the advantage of the public to encourage the settlement, by affording relief to the ship-wrecked, and profitable to the proprietors by grazing, fishing, and killing seals for their oil skins. Le Mercier does not even then seem to have received his grant, but he continued to have cattle on the island for some years, and also some settlers, and through his efforts many lives were saved. But he complains that evil-disposed fishermen stole his cattle and goods, and in 1744 we find him advertising in Boston papers a reward of £40 for the discovery of the depredators."

In 1753, Le Mercier[1] writes, "When I took Possession of the Island there was no four-footed Creatures upon it, but a few foxes some red and some black (some of which remain to this Day) now there are I suppose about 90 Sheep, between 20 or 30 Horses including Colts, Stallions and breeding Mares, about 30 or 40 Cows tame and Wild, and 40 Hogs."

It is said that about this time Le Mercier, failing to find a purchaser, abandoned his interests on Sable Island. Even though we cannot substantiate this, we can demonstrate that horses were placed on Sable Island by Thomas Hancock.

About 1760, according to Lieutenant-Governor Sir John Wentworth,[2] Thomas Hancock, a Boston merchant, desiring to relieve the suffering of those that chanced to be shipwrecked on Sable Island, fitted out a schooner and upon her embarked "Horses, Cows, Sheep, Goats, Hogs and Animals likely to live on the Island. These were landed there and generally answered very well. No great depredations were made on them till the commencement of the American

[1] Boston Weekly News-Letter, February 8 (1753).

[2] Rept. on Canadian Archives, 86 (1895).

War, during the course of which, privateersmen, and lawless persons of every description frequently landed on the island, and by the close of the War none of the Animals remained except a number of Horses. These Horses have been the means of affording food to many unfortunate persons who have since been thrown on the Island. * * * Many of them have been wantonly shot by persons wintering on the island for the purpose of wrecking. By such means as these, the greater part of the horses have been destroyed, and unless some remedy is found, this last hope of the unfortunate Mariner, will be entirely cut off."

Thus it is certain that horses of New England stock were left on Sable Island in 1753, or at least in 1760, and that Gilpin's assumption that these were the parent stock of the present-day Sable Island ponies is quite justified.

Gilpin describes them as he found them, "about four hundred in number, divided into about six herds, or gangs (so called), each gang headed by an old male, who was sufficiently conspicuous by his masses of mane and tail. Each herd had its separate feeding ground, to which the individuals composing it seemed to be equally attached, as to their leader. On driving over the Island, and mixing all herds, promiscuously, as we once did, by the next morning they had returned to their separate feeding grounds, some of them travelling ten or twelve miles during the night. On riding towards them the herd was seen grazing at the distance of a mile, with several outlying parties. The leader was observed repeatedly to drive these outlying mares and young horses into the general herd, who all now began a general retreat at a slow trot, with the exception of the old stallion, who faced the approaching party, passing backwards and forwards, frequently stopping and tossing back the mane from his eyes. The resemblance to a convoy crowding all sail to leeward, and a frigate in stays awaiting the enemy, was perfect. On pressing him, however, with our riding horses, he joined his herd now in a gallop, but keeping always in the rear. His instinct taught him the unequal match with man, but the air of leadership was unmistakable. They often fight among themselves, one stallion visiting the herd of a second. I saw a horse nearly disabled in one of these encounters. The young horses, between two and three years old, are driven out of the herd by the leader. I watched one, hour after hour, driving a young grey colt with the most furious bites, to a distance. The young horses live in small bands on the outskirts of the herd, and sometimes an old or disabled

mare, unable to keep up, drops behind; she is an object of the greatest attraction to them, soon produces foals, and thus a nucleus of a new herd is formed.

"I never saw one lying down to rest. They seem to sleep standing. They persistingly refuse the shelter of a stable, or the society of man, always moving from him. In the roughest weather escaping from the stable they would put a mile or two between them and it, before they stopped to graze; in this respect differing widely from the semi-wild cattle, which besieged the barn doors with their lowing during the winter. * * *

"To sum up then what we read from this narrow page in natural history, opened to our view, and in which my sole assumption is their origin from two or three individuals, we find that, left to themselves, following the laws of natural selection, their descendants in one hundred and fifty years, have returned to the habits and manners of the tarpany, or only stock of wild horses now existing in the world. That, in regard to their form they differ in some respects from the tarpany, though agreeing with them in size, hairy head, and thick coat: but, although differing from these, they have wonderfully reproduced forms, of whose existence we only know from the sculptures of Nineveh and the friezes of the Parthenon, where we find the low stature contrasted by the tall rider, the abundant tail and mane either cropped or tied and plaited, to prevent its encumbering the rider, the hairy jowl and horizontal head, and the short and cock-thrappled neck, and in some figures the short croup and low tail. * * *

"As regards colour we find that the original stock carried with them the germ of all colours known from ages, not only the bays and browns which we consider the natural colours, but the more startling varieties of pure white, and piebald,—piebalds known from ages, on old China coin, upon the ancient Thracian hills, from whose back Attila ravished worlds, and the mark of whose foot, it was his boast, that neither nature nor man could efface. We find, too, the chestnuts prevailing with their extremities coloured like their bodies, their tails and manes growing ever lighter, and a tendency to a dark streak on the back and withers; lastly, the blue greys or mouse or tans, with the same dark streak. Here, too, there is nothing new; the ancient Assyrian dun, and the Phrygian cerulean breeds of the time of Homer, are all prototypes, though the latter is scarcely known among our domestic breeds."

At various times the government authorities concerned with Sable Island have tried to improve the breed of the ponies. "A few unsuccessful experiments[1] have been tried, and the tame horses being let loose, have been killed by the wild ones." Howe recommends, in conclusion, the introduction of blooded stallions. This, too, has been tried, without results. To one familiar with the history of the Sable Island ponies, this failure is not surprising, for the newly introduced horses are set loose and allowed to breed freely with the wild ponies. No artificial selection is exercised, and as these new horses and their offspring exist under the same living conditions that wrought the horses from New England into Sable Island ponies, they, or rather their offspring, become Sable Island ponies, and no "improvement in the breed" is realized.

Early Botanical Records.

The botanical history of Sable Island is not very extensive but it begins with a record of extraordinary interest.

Johannes de Laet in the third, which is a Latin edition of his work mentions[2] in his account of Sable Island, or Insula de Sable as he calls it, "fruticeta multa, paucissimae arbores, humus fere nuda aut leviter herbida;." When translated this is; "there are many thickets of shrubs, very few trees, the soil is almost bare or lightly clothed with vegetation." To the present state of the island these statements are all applicable, the sand dunes are bare, or lightly clothed with vegetation, there are thickets of shrubs formed mostly of *Rosa virginiana* Mill., but also of *Myrica carolinensis* Mill., *Ilex verticillata* (L.) Gray, *Viburnum cassinoides* L., and *Rubus arcuans* Fernald & St. John, but at present there are no native trees of any sort. This clause which is quoted and translated from de Laet does not occur in the first and second editions of his work, which are in Dutch. It is added to the end of the paragraph devoted to Sable Island in the third or Latin edition, and it appears with similar wording in the fourth or French edition. Johannes de Laet was born in Antwerp in 1585 and died in Amsterdam in 1649. He had direct connections with the new world, being a "patroon" of Rensselaerswyck (now Albany, N. Y.) where his daughter and son-in-law had settled, and he was also a director of the Dutch West India Company. This official connection would

[1] Howe, Joseph: Append. to Journ. of House of Assembly Prov. N. S. 162 (1851).

[2] Laet, Johannes de: Novus Orbis seu Descript. Indiae Occ. ed. 3, 37 (1633).

give him access to the records of the Company and it is probably in this way that de Laet gained his information about Sable Island.

He relates the early history of the island, the attempt to found a colony there by Baron de Lery, of the stocking of the island with cattle and pigs, the incident of Marquis de la Roche and the convicts whom he abandoned on the island, describes the series of deeps and shallows, that is the bars which surround the island, and the consequent difficulty in making a landing, and he cautions, "nor in my opinion is it reasonably worth while (neque sane, ut opinor, meretur)." The absolute accuracy of these other statements about Sable Island by de Laet confirms the value of his statement that at 1633, the time of his writing, or a few years before, there were a very few trees on the island. The botanists of his time were still classifying plants on the basis of their habit, whether herbaceous, shrubby, or arborescent, so there is no reason for thinking that he did not know a tree from a shrub. Comparable regions on the mainland, such as Cape Cod or Plum Island, Massachusetts, have even in many exposed parts, clumps of trees in the hollows between the dunes. Of course, as far back as 1633, Sable Island was much larger than it is at present, and its sand hills much higher, so there would have been more sheltered spots in which trees could grow. Taken all in all, every bit of evidence seems to indicate that de Laet's statement can be accepted at face value, that in 1633, or shortly before then, there were a few native trees growing on Sable Island.

From Gov. John Winthrop's Journal[1] we learn that, in 1633, a certain John Rose was wrecked in the *Mary and Jane* on Sable Island. From the timbers of his wrecked vessel he managed to construct a small pinnace in which he made his way to Acadia. There he was detained a prisoner by the French, and forced to pilot them back to Sable Island in their search for walrus and cattle. Finally, being set free, Rose returned to Boston. He reported great numbers of cattle and foxes and, "There is no wood upon it, but store of wild peas and flags by the ponds, and grass."

In 1753, Andrew Le Mercier published[2] the next notice of Sable Island that contains any reference to its natural history. "It produces naturally near 20 sorts of Berries, out of which some People suppose very good Liquors and Wines might be expressed—It looks

[1] Winthrop, John: The History of New England from 1630 to 1649, edited by James Savage, i. 162 (1825).

[2] Boston Weekly News Letter, Feb. 8 (1753.)

all green in Winter with the Juniper Bushes and red in Summer with the large Strawberries and other wild Fruits which it bears.—It hath abundance of wild or Beach Pease, which fatten the Cattle very well. * * * There is neither Trees (but many Bushes) nor Stones. —The Grass is tall, thick and hath a very sweet taste and nourishing Property; there is some English Grass, but the other is more profitable, and there is enough to feed some thousand Heads of Cattle."

All of the native plants mentioned by Le Mercier, juniper bushes, strawberries (though they hardly color the ground red), and beach pease, grow there to-day.

With reference to the quotation from de Laet given above, it will be noticed that Le Mercier says, "There is neither Trees (but many Bushes) nor Stones" and that John Rose reported "no wood upon it" in 1633, so by the year 1753 any trees which had formerly existed on Sable Island had, in all probability disappeared.

Joseph Frederick Wallet Des Barres made a survey of Sable Island in 1766 and 1767 in compliance with orders from the British Admiralty. In his page and a half of "Remarks on the Isle of Sable,"[1] we find, "The whole island is composed of fine white sand, much coarser than any of the soundings about it, and intermixed with small transparent stones. Its face is very broken, and hove up in little hills, knobs and cliffs, wildly heaped together, within which are hollows and ponds of fresh water, the skirts of which abound with cranberries the whole year, and with blueberries &c. in their season, as also with ducks, snipes, and other birds. This sandy island affords a great plenty of beach grass, wild pease, and other herbages, for the support of the horses, cows, hogs, &c. which are running wild upon it. It grows no trees but abundance of wreck and drift wood may be picked up along shore for fuel."

Seth Coleman reported[2] to Lieutenant-Governor Sir John Wentworth on conditions at Sable Island as he found them June 24th, 1801, saying, "The soil in general is nearly the same excepting upon the upland, which is principally of a nature to produce Beach Grass intermixed with the wild Pea, and round the Edge of the Pond, there is a finer kind of grass, but much of the same quality, and I discovered some small spots of English Grass, and on the boarders of the Pond Vegetables might be raised, if enclosed for Gardens, * * * and

[1] Des Barres, Joseph Frederick Wallet: The Isle of Sable, Survey'd in 1766 and 1767. Atlantic Neptune, i. 68 (1777).

[2] Rept. on Canadian Archives, 91 (1895).

I have no doubt but Indian Corn might be produced, but not in large quantities."

In 1850, Joseph Howe visited Sable Island, and reported[1], "I was agreeably surprised to find it covered, for nearly its whole length of five and twenty miles, with natural grass and wild peas, and sustaining by its spontaneous production, five hundred head of wild horses, and ten or twelve head of cattle.

"Cranberries of large size, and fine flavour, grow in abundance on Sable Island. A few barrels of these are generally picked in the autumn, but the cranberry, as a source of income, or a means of employment, has scarcely ever been thought of by our people."

An anonymous writer[2] says, "It was in the year 1851, when employed as one of the assistants in the Admiralty Survey of the Gulf of St. Lawrence, that orders were unexpectedly received to proceed to Sable Island, and report upon the erection of a lighthouse. * * * The amount and variety of vegetation on this gigantic sand bar is extraordinary. Besides several kinds of grass, there are wild peas, and other plants, affording subsistence to between 400 and 500 wild horses, and an innumerable colony of rats and rabbits, as well as the domestic cattle kept for the use of the establishment. * * * In the neighbourhood of the chief residence, where white clover and other grasses have been sown, so luxuriant is the yield that over 100 tons of hay are made annually. There are several edible berries, the strawberry in the richest profusion covering the ground upon which we rode, with none to gather them. Cranberries abound."

In 1858, J. B. Gilpin published[3] a charming little book on Sable Island in which he devotes one paragraph to its botanical features:

"A Botanist would give a scientific list of thirty or forty varieties of shrubs and plants. Trees there are none, and the usual shrubs are dwarft to a few inches; a little ground juniper and low with-wood would not afford a riding-cane. Tall coarse grasses cover the surface of the ground, alternating with sandy barrens and snowy peaks of blown sand. The wild rose, blue lily, and wild pea enamel the valleys. Strawberries, blueberries and cranberries are in abundance. They are measured by bucket-fulls; and as Autumn heats yellow the

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[1] Howe, Joseph: Appendix to Journ. of House of Assembly, Prov. of N. S. no. 24, 161–164 (1851).

[2] The Leisure Hour, xxx. 432–433 (1881).

[3] Gilpin, J. Bernard: Sable Island, Its Past History, Present Appearance, Natural History etc. 18–19 (1858).

luxuriant green, the tall, mallow, gay golden rods and wild China-asters are swept by the heaving gales."

Joseph Charles Taché, in 1885[1], published a book which in so far as it refers to Sable Island is very little but a free translation of J. B. Gilpin's "Sable Island." In a different form he reproduces Gilpin's paragraph on the botanical productions of the island. For some reason he feels that Gilpin's estimate of the size of the flora was not adequate, and he, Taché, says[2], "On a dit qu'un botaniste pourrait y observer trente à quarante espèces ou variétés; mais il est certain qu'un catalogue complet des plantes de l'île et de ses rivages, qui comprendrait les mousses, les algues et les plantes d'occasion, aurait beaucoup plus d'étendue que cela."

In 1890, an anonymous writer[3] makes the first mention of the occurrence of blackberries on the island: "On the shores of the lake, which extends for about eight miles, may be gathered in their season the wild pea, wild roses, lilies, asters, strawberries, blackberries, and cranberries. From these wild fruits a small revenue is derived by the men of the life-saving station, who gather and ship them to Nova Scotia."

The Rev. George Patterson in his article[4] devotes one sentence to the flowers and fruits. All of the species mentioned occur in Gilpin's "Sable Island" with almost the identical wording, and Patterson refers to him in a footnote on the following page.

The first naturalist to visit Sable Island was Dr. Jonathan Dwight, Jr. From the 28th of May until the 14th of June, 1894, he was on the island with the special object of ascertaining the breeding-home and habits of the Ipswich Sparrow, which were at that time quite unknown. This he accomplished very successfully.

Although it was quite early in the season, Dr. Dwight gave considerable attention to the flora. "It[5] was impossible to study satisfactorily the flora of Sable Island, for at the time of my visit few of the plants had more than just opened their earliest buds, and of

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[1] Tache, Joseph Charles: Les Sablons (L'Ile de Sable) et L'Ile Saint-Barnabé, 1–154 (1885).

[2] *l. c.* 29.

[3] Anonymous: The Graveyard of the Atlantic. All the Year Round, lxvi. 517–522 (1890).

[4] Patterson, Rev. George: Sable Island, Its History and Phenomena. Trans. Roy. Soc. Can. xii. § 2. 5 (1894).

[5] Dwight, Jonathan, Jr.: The Ipswich Sparrow. Mem. Nuttall Ornith. Club, ii. 12–13 (1895).

the species collected, many could not be positively identified even by so able a botanist as Dr. N. L. Britton of Columbia College, who was kind enough to make the attempt for me and to furnish the scientific names. * * * The blueberry bushes were blossoming the second week in June, many of the tiny sprigs trailing in the sand, partly covered by it, and the leaf buds of the rose bushes were little more than half unfolded." This short quotation will give a hint of the condition of the vegetation and Dr. Dwight's interest in it. He says[1] "my specimens show that not less than forty species occur." "I[2] make no pretense to a complete enumeration of the plants of Sable Island, for reasons given, but those that I have mentioned are among the most conspicuous and characteristic of its flora, which resembles in many respects that of the adjacent mainland."

He mentions several species that have been cultivated, and also some that were presumably introduced, but to him appeared so thoroughly naturalized that they were hard to distinguish from the native ones. To quote his own words[3]: "Timothy (*Phleum pratense* L.) and Red-top Grass (*Agrostis alba vulgaris* With.), as well as Red Clover (*Trifolium pratense* L.), have been cultivated near the stations, and White Clover (*T. repens* L.) is frequently met with, but man's influence has been at work on the island for so many centuries that it is almost impossible to draw the line between indigenous species, if such there be, and those artificially introduced. * * * Before my departure nearly the whole surface had acquired a visibly greener tinge with here and there the ruddy glow of blossoming Sorrel (*Rumex Acetosella* L.) while such weeds as the Beach Pea (*Lathyrus maritimus* (L.)), Everlasting (*Gnaphalium* sp.?), and Meadow-rue (*Thalictrum* sp.?) were becoming conspicuous."

It is quite true as Dr. Dwight says, that some of the introduced species have made themselves thoroughly at home on the island, but the writer in no case had any difficulty in deciding whether or not a plant was a native. *Trifolium repens* is frequent on the island, particularly on the dry sands near the Life Saving Stations and along the shores of the adjacent ponds where the cattle and the domesticated ponies browse continually. It does not occur in the remoter parts of

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[1] Dwight, *l. c.* 13.
[2] Dwight, *l. c.* 14.
[3] Dwight, *l. c.* 12.

the island, and does not seem to the writer to be a native plant. *Rumex Acetosella* is obviously an introduced species.

Observations in 1851[1] confirm that the white clover is an introduced species here: "In the neighbourhood of the chief residence, where white clover and other grasses have been sown, so luxuriant is the yield that over 100 tons of hay are made annually."

Why Dr. Dwight called *Lathyrus maritimus* and the *Thalictrum* weeds, is not made clear, and the writer cannot imagine any explanation of it. They are both characteristic of and generally distributed on the dry sand dunes, which are surely a habitat on which native plants would be expected.

Dr. Dwight mentions in his paper by generic or specific names twenty-seven plants. The remaining thirteen are presumably immature and at that time almost indeterminable specimens. The plants are all in the Herbarium of the New York Botanical Garden, but no list of them was kept.

Dwight's admirable scholarly report contains as well as his data and remarks upon the Ipswich Sparrow, chapters on various features of Sable Island: the History of Sable Island, its Physical Aspect, its Climate, its Flora, its resident Mammals, and Birds.

The first botanist to visit Sable Island was the Botanist of the Canadian Geological Survey, John Macoun, who landed on the island July 20, 1899, and remained there for five weeks. In his Report for that year[2] he gives a general account of the island and some mention of its flora. On the mooted question whether the island was ever wooded he brings some evidence. "I am inclined[3] to believe that trees have never grown upon the island. On one occasion I saw roots protruding from under a sand-hill over thirty feet high, and on digging them out found that they represented part of the remains of a specimen of *Juniperus Sabina procumbens* (creeping juniper). It was rooted in a layer of black soil and when taken out showed that it had lain flat on the ground. Two of the roots, including the bark, measured 3⅝ and 3⅜ inches in diameter respectively, while the crown, where the branches began to spread was over seventeen inches in circumference or nearly six inches in diameter. This growth and others observed under sand-hills indicate long periods of vegetation without encroachment of sand, so that when these shrubs lived, the lagoon was

[1] The Leisure Hour, xxx. 432 (1881).
[2] Ann. Rep. Can. Geol. Surv. xii. n. s. 212–219 A (1899).
[3] Macoun, *l. c.*, 217 A.

a quiet lake and the north side of the island was miles removed, as no sand reached these localities for many years.

"Though there are no trees on the island and shrubs never attain more than a foot in height, these, if sheltered from the sea air and winter gales attain a considerable size. About fourteen years ago, Mr. Boutellier planted a willow and an elm, both of which are now about five feet high. Every summer they make a fine growth, but during the winter are killed back to the point at which they are protected by an adjoining fence. Even in summer, as I learned from my own observations, the leaves above the shelter of the fence are small and badly formed, and after a strong gale or heavy fog the tender ones become blackened or shrivelled at the edges, while those that were protected were very large and well formed." The two planted trees mentioned by John Macoun, were still living in 1913, that is twenty-eight years after their planting. They had good sturdy trunks for about two feet, then bushed out into broom-like heads of innumerable fine shoots that stretched up above the protecting board fence. As John Macoun stated, each year all of these upright shoots are killed back to the level of the top of the fence.

He makes the generalization that "all the shrubs are natives of Newfoundland and Nova Scotia."[1] This seems to be the case, with the exception of *Rubus arcuans* which is not known from Newfoundland, and at that time was not known to Professor Macoun.

Plant Habitats.

On an island consisting of a 20-mile stretch of sand dunes there can be little diversity of plant habitats. Nevertheless, a variety of these is found on Sable Island, and they may be distinguished as follows:

Sea Beaches.—These are of pure white sand. This is true, except for one bit of the South Beach, east of the Life Saving Station No. 3, where magnetite, as iron sand, is so abundant as to alter the color. The vegetation of this strip, however, is not perceptibly different from that on other parts of the beach. Because of the encroachment of the waves, the beach is very steep, the loose dry sand rising abruptly to the base of a dune. At the very top of the beach in the soft, wind-blown sand are a few clumps of *Arenaria peploides* L., var. *robusta* Fernald, all of them with their young shoots gone, eaten off by the gangs of wild ponies. Here and there are small single plants of *Cakile edentula* (Bigel.) Hook.; otherwise the beach is bare of vegetation.

[1] Macoun, *l. c.* 218 A.

Sand Flats and Sand Spits.—Not long ago the salt lake, Wallace Lake, was sheltered by rows of dunes on both its north and its south shores, but now from most of the south side the dunes have been swept away, and between the southern shore of Wallace Lake and the South Beach of the Island, there is nothing but a great sand flat over which the waves break during all heavy storms. Sand spits and dry bars quite similar in character extend out for some distance from either end of the island. On all of these the *Arenaria* thrives, and here also it is despoiled by the ponies, so much so that it is almost impossible to find fruiting specimens. The bareness of these stretches is also broken by occasional mats of *Limosella subulata* Ives.

Wallace Lake and the Brackish Ponds.—Wallace Lake, though often for short periods shut off from the sea, is quite as salt as is the sea itself. In the lake is an abundant growth of *Zostera marina* L., which is not met with elsewhere.

Especially at the eastern end of Wallace Lake, near Life Saving Station No. 3, and near the Wireless Station are series of ponds reached by the salt water only during the heaviest fall and winter storms. These ponds form a perfect series from the outer ones which are quite brackish to the inner which are fresh. These brackish ponds have a much more abundant vegetation than does Wallace Lake. In them are great masses of Pondweeds, *Potamogeton bupleuroides* Fernald, *P. pectinatus* L., and *P. pusillus* L., var. *capitatus* Benn., as well as *Ruppia maritima* L., var. *longipes* Hagström. Around the borders of these ponds will be found *Carex Oederi* Retz., var. *pumila* (Coss. & Germain) Fernald, and great clumps of *Spartina Michauxiana* Hitchc., *Aster novi-belgii* L., var. *litoreus* Gray, and *Scirpus acutus* Muhl.

Lake Beach.—As the tides in Wallace Lake are very small or none at all, and as the waves during storms cannot become large and destructive, the Lake Beach has an abundant vegetation on its broad expanse. Over great stretches it is covered with a smooth green carpet made up of numerous species, among which are *Juncus bufonius* L., var. *halophilus* Buchenau & Fernald, *Chenopodium rubrum* L., *Spergularia leiosperma* (Kindb.) F. Schmidt, *Ranunculus Cymbalaria* Pursh, *Potentilla pacifica* Howell, *Plantago major* L., var. *intermedia* (Gilibert) Dcne., and *P. decipiens* Barneoud. Out of the sward formed by these lowly plants grow the less numerous taller ones, such as *Rumex maritimus* L., var. *fueginus* (Phil.) Dusén, and *Atriplex patula* L., var. *hastata* (L.) Gray.

Sand Dunes.—If one may be allowed to generalize, the whole island is only a series of undulating sand dunes. All of them are in a continuous state of flux, but at any one time they can all be placed into one of several categories. A strong sea breeze blowing at low tide will pick up grain after grain of sand from the dry upper half of the beach, and transfer it inland. A storm wind, while doing the same thing, will often make a breach in the outer side of the most exposed dune, whirl away the sand from the roots of the protecting vegetation, and soon form a deep gully from which the sand is swirled inland without obstruction. Coming from either of these sources, the sand is blown inland, then dumped in a quiet place. Whatever happens to be beneath, pond, cranberry-bog, or Life Saving Station, is buried by the new dune. These most recently formed dunes are to be met with all over the island, and are, of course, without vegetation. During the growing season the plants near by will tend to colonize them and, unless the boisterous winds keep them in constant motion, young plants will come up on them and tend to hold them in place. The first to appear in such situations is the Beach Grass, *Ammophila breviligulata* Fernald. Soon after, *Lathyrus maritimus* (L.) Bigel. and *Solidago sempervirens* L. appear. If other storms do not interfere by shifting the dune to still another place, these plants will spread, and before long the dune will be fairly covered with vegetation and anchored by roots. Other species will creep in and join these three dominant ones, and soon the dune has on it many species such as *Deschampsia flexuosa* (L.) Trin., *Festuca rubra* L., *Smilacina stellata* (L.) Desf., *Fragaria virginiana* Duchesne, var. *terrae-novae* (Rydb.) Fernald & Wiegand, *Rosa virginiana* Mill., *Convolvulus sepium* L., and *Anaphalis margaritacea* (L.) B. & H., var. *subalpina* Gray. On the protected slopes of the more permanent dunes these species, especially the Rose, the Beach Pea, and the Morning Glory, form a tangle that is waist-high and very difficult to penetrate.

Empetrum Heaths.—These are in reality the ultimate stage in the evolution of the sand dune. They are found in the middle of the broadest part of the island, the place most protected from the eroding elements. The dunes themselves are low and undulating, and covering them is a low vegetation, composed especially of the trailing branches of *Empetrum nigrum* L., *Juniperus communis* L., var. *megistocarpa* Fernald & St. John, and *Juniperus horizontalis* Moench. Together they form a green, springy carpet nearly a foot in thickness. Mixed with the dominant species are of course others, such

as *Ammophila breviligulata* Fernald, *Lathyrus maritimus* (L.) Bigel., *Solidago sempervirens* L., and *Aster novi-belgii* L., which are ubiquitous on all the drier parts of the island; there are also such species as *Coptis trifolia* (L.) Salisb., *Pyrus arbutifolia* (L.) L. f., var. *atropurpurea* (Britton) Robinson, *Vaccinium pennsylvanicum* Lam., *Trientalis borealis* Raf., *Mitchella repens* L., *Lonicera caerulea* L., var. *calvescens* Fernald & Wiegand, *Linnaea borealis* L., var. *americana* (Forbes) Rehder, and *Viburnum cassinoides* L. These stretches here called Empetrum Heaths are what J. Macoun in his article called the "old land." In this area he found *Polypodium vulgare* L., a surprising plant to find on a sand-dune island. Yet we learn from Warming[1] that in northern Europe it occurs on the gray sand dunes, and Fernald & Long found it in 1919 on sheltered wooded slopes of sand hills at Provincetown on Cape Cod.

Dune Hollows—The shallow hollows between the dunes are often dry and destitute of vegetation, but if the hollows are deep, they approach the water table which is relatively high.

This water table has frequently been commented upon; for it is well known that clear fresh water can be obtained by digging a few inches or feet in any of the dune hollows. The level of this water table has, of course, a relation to the height of the water in the fresh-water ponds. But through all this is a fundamental factor which we cannot yet explain. There is no evidence to show that there is any hard or impervious stratum underlying Sable Island. If such a layer existed near the surface it would surely be known, and it would have to be near the surface to govern the relative position of the water table as observed. To the best of the writer's knowledge, no deep borings have ever been made on the island. In discussing this obscure feature of Sable Island, Sir J. W. Dawson[2] says, "Pools of fresh water, however, appear in places, which would seem to imply that there is an impervious subsoil. This may, however, be caused by the *floating* of rain water on water-soaked sand, an appearance which may sometimes be observed on ordinary sand beaches, where, in consequence of their resting on the surface of the sea-water, these pools or springs sometimes rise and fall with the tide. I am not aware, however, that this occurs at Sable Island." Any such tidal variation in the level of the fresh-water ponds would be very conspicuous, but no such feature has ever been observed on the island. We must

[1] Warming , Eugene: Oecology of Plants. English ed. 267 (1909).

[2] Dawson, Sir John William: Acadian Geology, ed. 3, 37 (1878).

leave this problem, then, having advanced no farther than the stating of the difficulty. These wet dune hollows support the most abundant vegetation of any part of the island. The first plant to appear and the quickest to spread is *Vaccinium macrocarpon* Ait., and it forms a thick carpet in all of the wet hollows, though it is sometimes obscured by taller-growing plants. Conspicuous among its companions in such places are *Lycopodium inundatum* L., *Carex canescens* L., var. *disjuncta* Fernald, *Juncus balticus* Willd., var. *littoralis* Engelm., *J. articulatus* L., var. *obtusatus* Engelm., *Sisyrinchium gramineum* Curtis, *Calopogon pulchellus* (Sw.) R. Br., *Hypericum virginicum* L., *Viola lanceolata* L., *Lysimachia terrestris* (L.) BSP., *Lycopus uniflorus* Michx., var. *ovatus* Fernald & St. John, and *Agalinis paupercula* (Gray) Britton, var. *neoscotica* (Greene) Pennell & St. John.

Fresh-water Ponds.—A mere stage beyond the wet dune hollows are the fresh-water ponds which occupy all of the deepest dune hollows. Some are only seasonal and disappear during any dry spell, but a considerable number are permanently maintained by the rain water.

Most of these ponds have a pure sand bottom, but a few of the deeper and more permanent have accumulated a layer of black muck over the bottom. Around their shores they have the cranberries and most of the other plants characteristic of the wet dune hollows, but they have many additional species, as *Eleocharis palustris* (L.) R. & S., *Juncus bulbosus* L., *Iris versicolor* L., *Rumex Britannica* L., *Polygonum hydropiperoides* Michx., var. *psilostachyum* St. John, *Tillaea aquatica* L., *Potentilla monspeliensis* L., var. *norvegica* (L.) Rydb., *P. palustris* (L.) Scop., *Lathyrus palustris* L., vars. *macranthus* (T. G. White) Fernald, and *retusus* Fernald & St. John, *Epilobium molle* Torr., var. *sabulonense* Fernald, *Centaurium umbellatum* Gilib., *Menyanthes trifoliata* L., and *Teucrium canadense* L., var. *littorale* (Bicknell) Fernald.

In one area, that part of the "old land" bordering the fresh-water ponds near the Marconi Station, conditions have been stable enough, and the vegetation vigorous enough, to form a deposit of loamy soil. It does not exceed a few acres in extent and nowhere is it more than a foot and a half in thickness. It lies directly on the white sand that forms the rest of the island. The vegetation on this loamy area is more vigorous, but not different in character from that around the borders of other fresh-water ponds. In the shallow borders of the ponds is another series of species, not to be found in the wet dune hol-

lows. Among these are *Typha latifolia* L., *Potamogeton polygonifolius* Pourret, *P. epihydrus* Raf., *Eriocaulon septangulare* With., *Nymphozanthus variegatus* (Engelm.) Fernald, *Myriophyllum tenellum* Bigel., *Hippuris vulgaris* L., and *Lobelia Dortmanna* L.

Phytogeography.

In studying the geographic affinities of the flora of Sable Island, it was realized that this problem was but a small part of the much larger one of the relations and sources of the floras of Newfoundland, Prince Edward Island, and adjacent regions. It was, in fact, in the hope of throwing some light on this larger question that the trip to Sable Island was planned. And now, in this discussion of the flora, the general scheme used by Prof. M. L. Fernald in his analysis of the geographic relationships of the flora of Newfoundland[1], has been followed as far as it is applicable to this smaller flora.

There is an element of definitely adventive plants, 51 in number. These are in most cases confined to the immediate neighborhood of the Life Saving Stations or the lighthouses, in the cultivated fields, along the paths, or near the stables. A few species such as *Anthoxanthum odoratum* L., *Rumex crispus* L., *Rumex Acetosella* L., *Cerastium vulgatum* L., *Trifolium repens* L., and *Cirsium arvense* (L.) Scop. have spread to the shores of the fresh-water ponds or to the dry dunes, and made themselves very much at home. In every case, however, they can be demonstrated as a foreign element in the flora. As a result of the very extensive tree planting on the island there are a few species or individual trees that have survived and must be considered now as a part of the flora. These planted species total 15 in number. Together with the 51 adventives they give us a total of 66 plants, which will be excluded from the further discussion of the phytogeography of the island.

The native flora consists of 147 species, varieties, and forms. They fall into the primary classes:

Class I. Boreal types.
Class II. Southwestern types.
Class III. Endemic plants or species unknown on the American continent.

Class I. Boreal Types.—This class includes all of the plants that occur to the north of Newfoundland in Labrador proper, south-western Greenland, or the Arctic regions. A few of the species could

[1] Fernald, M. L.: Rhodora, xiii. 136 (1911).

be classed as Arctic, but the great majority are Hudsonian or Canadian types, and it does not, in considering this region, seem worth while to try to distinguish between them. The boreal types total 45 plants, = 30 per cent. of the Sable Island flora.

A few examples will indicate the make-up of this class: *Elymus arenarius* L., var. *villosus* E. Mey., *Spiranthes Romanzoffiana* Cham., *Arenaria lateriflora* L., var. *typica* (Regel) St. John, *Drosera rotundifolia* L., *Fragaria virginiana* Duchesne, var. *terrae-novae* (Rydb.) Fernald & Wiegand, *Potentilla palustris* (L.) Scop., var. *parrifolia* (Raf.) Fernald & Long, *P. tridentata* Ait., *Empetrum nigrum* L., *Hippuris vulgaris* L., *Ligusticum scothicum* L., *Coelopleurum lucidum* (L.) Fernald, *Cornus canadensis* L., *Menyanthes trifoliata* L., *Euphrasia purpurea* Reeks, var. *Randii* (Robinson) Fernald & Wiegand, *Plantago decipiens* Barneoud, *Linnaea borealis* L., var. *americana* (Forbes) Rehder, *Anaphalis margaritacea* (L.) B. & H., var. *subalpina* Gray, and *Senecio Pseudo-Arnica* Less.

Class II.[1] *Southwestern Types.*—This class consists of plants found chiefly in regions to the southwest of Newfoundland. It totals 83 plants = 55 per cent. of the flora. It falls into three subdivisions.

Subclass A. Canadian and Alleghanian plants mostly common to Newfoundland, Nova Scotia, New Brunswick and coastal New England, but unknown in eastern Saguenay County, Quebec, or Labrador. These total 36 plants = 24 per cent. of the flora.

As typical of this subclass may be listed: *Polypodium vulgare* L., *Osmunda cinnamomea* L., *Scirpus acutus* Muhl., *Spartina Michauxiana* Hitchc., *Habenaria bracteata* (Willd.) R. Br. (does not reach Newfoundland), *Rubus hispidus* Michx., *Hypericum virginicum* L., *Galium Claytoni* Michx., *Mitchella repens* L. (does not reach Newfoundland), and *Viburnum cassinoides* L.

Subclass B. Species having affinities with the Southern Coastal Plain, usually belonging to genera or having nearly related species

[1] Class II of Prof. Fernald's discussion (*l. c.* p. 138), the Western types, is represented on Sable Island by only two plants, *Polygonum hydropiperoides* Michx., var. *psilostachyum* St. John, occurring on Sable Island and along the Columbia River in Washington, and *Lycopus uniflorus* Michx., var. *ovatus* Fernald & St. John, occurring on Sable Island, at Canso, Nova Scotia, and at Sullivan's Gulch, Portland, Oregon. If Sable Island contained a greater diversity of soils it is probable that more of these western plants would occur there. Many of them are calcicoles, so it is not surprising that they are not to be found on Sable Island, which presents nothing but sand, wet or dry.

characteristic of the southern Coastal Plain, but themselves extending beyond its geological limits, following the sandy or acid-peaty soils northward and inland. These total 24 species = 16 per cent. of the flora.

To typify this subclass we can cite: *Panicum huachucae* Ashe, *Eriocaulon septangulare* With., *Juncus canadensis* J. Gay, *Sisyrinchium gramineum* Curtis, *Calopogon pulchellus* (Sw.) R. Br., *Pyrus arbutifolia* (L.) L. f., var. *atropurpurea* (Britton) Robinson, *Ilex verticillata* (L.) Gray, *Myriophyllum tenellum* Bigel., *Utricularia cornuta* Michx., *Lobelia Dortmanna* L.

Subclass C. Southern Coastal Plain species ranging from Texas, Florida, the Carolinas, or New Jersey northward along the sandy coastal strip, Long Island, Nantucket, Cape Cod, to Sable Island, to Newfoundland, or Prince Edward Island, uncommon or unknown inland in continental eastern Canada. These total 23 plants = 15 per cent. of the flora. It is noteworthy that the endemic fresh-water sponge, *Heteromeyenia macouni* Mac Kay, has as its nearest relatives *H. ryderi*, var. *baleni*, ranging from Florida to New Jersey, and *H. ryderi*, var. *walshii* from Gilder Pond, Mount Washington, Massachusetts.

This subclass contains *Ammophila breviligulata* Fernald, *Agropyron repens* (L.) Beauv., var. *pilosum* Scribn., *Carex silicea* Olney, *Carex hormathodes* Fernald, *Juncus articulatus* L., var. *obtusatus* Engelm., *Habenaria lacera* (Michx.) R. Br., *Myrica carolinensis* Mill., *Tillaea aquatica* L., *Rosa virginiana* Mill., *Viola primulifolia* L., *Centunculus minimus* L., *Teucrium canadense* L., var. *littorale* (Bicknell) Fernald, *Limosella subulata* Ives, and *Plantago major* L., var. *intermedia* (Gilibert) Dene.

Class III. Endemic Plants or Species unknown on the American Continent.—This includes 10 plants = 7 per cent. of the flora.

Subclass A. Endemic Plants.—This includes 6 plants = 4 per cent. of the flora. It is notable that in no case were the characters of the endemic plants strong enough to be considered specific; in every case they had to be treated as of formal or varietal rank. The six endemic plants are: *Juncus pelocarpus* Mey., var. *sabulonensis* St. John, *Calopogon pulchellus* (Sw.) R. Br., f. *latifolius* St. John, *Lathyrus palustris* L., var. *retusus* Fernald & St. John, *Epilobium molle* Torr., var. *sabulonense* Fernald, *Bartonia iodandra* Robinson, var. *sabulonensis* Fernald, *Hieracium scabrum* Michx., var. *leucocaule* Fernald & St. John.

Subclass B. Species characteristic of western Europe, not known in Iceland, Greenland, or Labrador, but occurring on Sable Island, and usually on St. Pierre, Miquelon, and the Avalon Peninsula of Newfoundland. This includes 4 plants = 3 per cent. of the flora. They are: *Potamogeton polygonifolius* Pourret, *Juncus bulbosus* L., *Polygonum Raii* Bab., and *Centaurium umbellatum* Gilib.

The 8 plants which are not included in any of these classes are either members of critical groups now under revision, or recently described species whose ranges are as yet imperfectly known.

Forestry Experiments.

Since 1801, the government of Nova Scotia, and later that of Canada have maintained one or more Life Saving Stations on Sable Island. The buildings of these establishments have been constantly threatened with destruction, either by burial in the drifting sand, or by being engulfed in the waves of a severe storm that might wash away the very site on which the buildings stand. Under these circumstances it is not strange that an attempt was made to hold in place the drifting sand hills that compose the island.

In 1900, Sir Louis Davies, Minister of Marine and Fisheries, requested William Saunders, Director of the Dominion Experimental Farms, "to consider the subject of a somewhat extensive experiment in tree planting on Sable Island." That same year Dr. Saunders[1] in company with Lieut.-Col. F. F. Gourdeau visited the seacoast of Brittany, "to see the results of the planting of pine forests there on the drifting sands on the ocean shores, to gain information as to the methods adopted in planting and the varieties of trees which have been successfully grown. * * *

"On returning to Ottawa a list of such sorts as were likely to be suitable was prepared with quantities desired. The trees and shrubs chosen included a large number of those which have succeeded well in drifting sands in France to which were added a number of other varieties which from Canadian experience were likely to prove useful for that purpose. Small lots of many other species were added to lend interest to the collection and to test their hardiness and adaptability to the climate of Sable Island. This list included in all

[1] Saunders, Wm.: Experiments in Tree Planting on Sable Island, Dominion Experimental Farms, Report, 63–77 (1901).

68,755 evergreens of 25 varieties, and 12,590 deciduous sorts of 79 varieties,"—as well as 50 pounds of the seed of the Maritime Pine, *Pinus maritima*. This large shipment reached Sable Island the middle of May, 1901, and under the direction of Lieut.-Col. Gourdeau and Mr. Saunders, planting was started at once. The crates were unpacked and the young trees, almost all of which arrived in good condition, were placed in trenches in the moist sand with their roots well covered. The work of planting the thousands of trees was pushed forward vigorously and completed on the 17th of June. Of the trees about 300 were planted near the East End Lighthouse, about 1000 at No. 2 Life Saving Station, about 5,000 at No. 3 L. S. S., about 3,000 at No. 4 L. S. S., and the remainder at Gourdeau Park, a section near the Wireless Station formed of low rolling dunes covered with a thick mat of trailing *Juniperus* and *Empetrum*. This area is one of those called Empetrum Heaths, where a thin layer of dark humus has been formed above the white sand.

An accurate statement of the nature and conditions of the soil and the climate of Sable Island where these young trees were planted is given by Mr. Saunders.[1]

"I brought with me a sample of the almost pure sand forming the soil on the top of the sandy bluff on which the first plantation was made in which the sand binding grass was growing, also two samples of the black peaty layer which covers the sand to a depth of 3 to 4 inches over a large portion of the central part of the island, probably to the extent of 1,800 to 2,000 acres. One of these was taken from the large area chosen for the plantation to be known as Gourdeau Park, and the other was from similar soil some miles further east. I also brought a sample of similar material picked up on the beach on the south shore where it was being washed by the sea. A fifth sample consisted of a bunch of the sand-binding grass *Ammophila arenaria* [= *A. breviligulata* Fernald]. These were submitted to the Chemist of the Experimental Farms, Mr. F. T. Shutt, for analysis, who reports on them as follows:

'Analysis and Report on Samples From Sable Island.

'*By Frank T. Shutt, Chemist, Dominion Experimental Farms.*

'No. 1. Sample of the sand from field on top of the bluff, northeast of the look-out, where first forest clump was planted. It contains roots of grass *Ammophila arenaria* [*A. breviligulata*]. Weight of sand 2 pounds 13 ounces, containing ¾ ounces of grass roots.

[1] Saunders, Wm., *l. c.*

'Analysis of this sand after separation of the greater part of the fibre showed .0018 per cent of nitrogen.

'Digestion of this sand with hydrochloric acid (sp. gr. 1.115) at the temperature of boiling water for 5 hours, showed that .412 per cent had passed into solution.

'The examination of this acid solution gave the following data:

'Oxide of iron and alumina	.328
'Lime	.062
'Phosphoric acid	.012

'Potash:—By the spectroscope, traces of potash were plainly discernable. With the usual reagent (platinic chloride) only a very faint precipitation was obtained when working on an acid solution from 10 grams of the sand.

'No. 2. Sample of peaty soil from surface underlaid by sand in central part of island 1½ miles east of residence of Superintendent where a large block of trees has been planted, locality known as Gourdeau Park, layer 3 to 4 inches thick.

'Analysis of (air-dried) peaty soil:—

	p.c.
'Moisture	4.87
'Organic matter	22.22
'Mineral matter practically sand	72.91
	100
'Nitrogen in organic matter	.878

'No. 3. Representative sample of peaty soil covering a large area some distance east of where No. 2 was taken, from 3 to 4 inches deep, and underlaid by sand. Weight soil, air-dried, 3 pounds 12½ ounces, containing 5½ ounces fibre.

'Analysis of (air-dried) peaty soil:—

	p. c.
'Moisture	1.48
'Organic matter	8.63
'Mineral matter practically sand	89.89
	100
'Nitrogen in organic matter	.271

'No. 4. Sample from a large lump of peaty soil found on the beach on the south shore, being washed by the sea. It contains a considerable amount of semi-decayed eel grass *Zostera maritima*. Weight of soil, air-dried, 1 pound 5 ounces, containing 2½ ounces fibre, principally eel grass.

'Analysis of (air-dried) peaty soil:—

	p. c.
'Moisture	3.00
'Organic matter	9.50
'Mineral matter practically sand	87.50
	100

'Nitrogen in organic matter..... .267

'The above three samples are similar in character, and no doubt also as to origin. They may be considered as semi-decayed vegetable matter (largely fibrous) and sand, and practically the only point of difference between them lies in the varying proportions of these two constituents. In the air-dried condition the sand can be very easily separated from the organic matter by shaking and sifting, showing that there is no intimate incorporation of these constituents as in the case of true soils.

'The plant food they contain other than nitrogen is present in very small amounts, and we must suppose exists in such a condition that it is only slowly set free for plant use.

'No. 5. Analysis of the (air-dried) grass or hay *Ammophila arenaria* [*A. breviligulata*] from Sable Island, chiefly barren stems:

	p. c.
'Moisture	12.42
'Protein	13.81
'Fat	.81
'Fibre	41.00
'Carbo-hydrates	26.71
'Ash	5.25
	100

'In protein or albuminoids this grass makes a very good showing, being quite equal in respect to these important nutrients to many of our highly esteemed cultivated grasses.

'The percentage of fibre is above the average, and this together with the somewhat high protein, necessarily makes the carbo-hydrates (starch, sugar, &c.) much lower than usual. This hay contains 5.25 per cent ash or mineral matter, which on further examination is found to include 1.37 per cent of sand. This sand had remained attached to the grass in spite of all care being taken to separate it.

'The indications are that though probably somewhat less digestible than the best hays made from grass cut before seeding, this Sable Island grass has a distinct and even moderately high feeding value due to its comparatively speaking large protein content.'

"The results obtained by Mr. Shutt are very interesting and valuable. The ponies, of which there are four bands numbering about 120 in all running wild on the island, feed almost entirely on this grass which looks tough and hard and does not impress one as likely to be very nutritious. The ponies, however, do well on it, and even the domestic cattle use it considerably, although they are said to prefer timothy and clover. The fact that this grass has a decided nutritive character is now demonstrated.

"Arrangements for the use of artificial fertilizers.

"Realizing at the outset that it was probable that the soil of some of the sites which might be chosen for tree planting on the island would be deficient in the elements of fertility needed for the healthy growth of trees, a sufficient quantity of artificial fertilizers was taken to Sable Island with the trees. These included nitrate of soda, muriate of potash, superphosphate of lime with a few barrels of quick lime. Instructions were left with the Superintendent as to the use of these after the trees were planted, and the proportions in which they should be mixed. That after mixing they should be diluted with an equal bulk of sand and scattered in small proportion over the ground once a month for three months, leaving a small portion of each plantation untreated for comparison. This would probably give the trees at the start sufficient plant food for healthy growth.

"A natural source of plant food.

"There is one source of plant food on Sable Island which should not be overlooked. Sea birds are most abundant there. After travelling over the greater part of the island and seeing the immense number of terns everywhere, from a rough computation of the number per acre and the acreage of the island we estimated that these birds alone did not fall far short of a million on the island. They feed on small fish, and they are so incessantly active that they consume large quantities and their droppings are seen on every hand. This perennial source of fertility must have its effect. Like the guano on the sea-girt islands in parts of South America this material is very rich in plant food, which is in readily soluble forms and the quantity deposited every year would probably be sufficient to supply a considerable part of the small proportion of these elements needed for healthy tree growth. Traces only of these useful elements are found in the clear, pure sand which covers so large a part of the surface of the island, probably for the reason that this fertilizing material if not promptly taken up by plant roots is so soluble that it is soon washed through the porous sand by frequent rains and its accumulation is thus prevented.

"Conditions of climate—strong winds.

"The climate is a very singular one, and one of the chief difficulties in the way of rapid success in tree planting is the force and constancy

of the winds, and the frequency of the gales. From the meteorological tables here given, prepared by Mr. W. T. Ellis from material kindly furnished by Mr. R. F. Stupart, Director of the Meteorological Service of Canada, covering nearly four years, it appears that the average hourly velocity of the wind during the whole of that period has been more than 18 miles, while the gales have averaged over 10 each month when the winds have ranged mostly from 40 to 65 miles an hour. A study of the temperatures will show that there are no extremes of heat or cold on the island; that the highest temperature during the past four years has been 78, and the lowest point reached by the thermometer during the same period was 5 above zero.

Months.	Maximum.	Minimum.	Total Precipitation.	Average hourly velocity of wind.	Maximum velocity.	Number of gales.	Fair.	Fog.
1898.	°	°	Inches.	Miles.		Days.	Days.	Days.
January	48.5	6.0	5.65	21.5	48	18	15	2
February	43.0	17.0	1.54	18.7	64	14	20	2
March	46.5	23.5	3.20	17.8	46	17	20	9
April	53.0	27.0	4.90	19.8	38	18	16	10
May	60.5	33.0	2.90	15.7	41	7	24	8
June	66.0	39.0	3.12	15.9	39	9	20	14
July	75.0	45.5	4.55	11.8	25	1	17	10
August	77.0	58.0	4.44	12.0	27	2	18	17
September	73.5	46.0	5.89	16.6	42	9	19	7
October	61.5	39.5	3.85	18.6	36	13	20	6
November	63.0	30.0	8.68	19.6	49	18	16	9
December	52.0	18.0	6.64	23.7	59	20	16	6
Averages	59.95	31.87	4.61	17.6	42.8	12	18	8
1899.								
January	48.5	7.5	2.17	24.4	53	21	19	3
February	39.0	9.0	2.78	26.0	65	19	17	6
March	47.5	17.0	4.96	22.6	46	20	22	13
April	48.0	29.0	1.65	19.5	56	13	22	12
May	59.0	28.0	2.62	18.2	39	10	21	7
June	64.5	41.0	4.97	12.8	27	3	16	11
July	71.0	52.0	2.30	14.9	31	5	22	21
August	74.5	56.0	3.76	12.6	32	2	20	2
September	72.0	48.0	3.52	16.0	40	7	20	8
October	69.0	44.0	5.71	16.8	46	9	22	6
November	59.5	32.0	2.66	20.0	56	12	18	8
December	53.0	24.0	4.31	18.8	49	18	17	6
Averages	58.79	32.29	3.45	18.5	45	12	19	8

Months.	Maximum.	Minimum.	Total Precipitation.	Average hourly velocity of wind.	Maximum velocity.	Number of gales.	Fair.	Fog.
1900.	°	°	Inches.	Miles.		Days.	Days.	Days.
January	52.5	17.0	5.76	23.7	56	20	14	5
February	52.0	7.0	3.59	26.5	56	20	17	3
March	48.5	15.5	6.15	22.2	52	19	16	8
April	52.5	32.5	5.55	19.4	46	16	14	6
May	57.8	34.0	3.04	16.2	37	6	19	7
June	69.0	40.0	2.84	14.2	27	6	21	14
July	75.0	49.0	2.25	13.4	32	3	23	18
August	73.0	51.0	6.16	13.6	40	4	17	6
September	70.0	47.0	5.66	16.2	49	7	17	8
October	66.0	37.0	2.31	17.4	51	11	21	5
November	60.5	27.0	2.94	22.7	46	24	11	8
December	49.0	20.0	2.94	21.8	52	15	14	3
Averages	60.48	31.41	4.09	18.9	45	12	17	7
1901.								
January	47.0	5.0	3.24	22.7	58	14	19	9
February	45.5	19.0	3.21	21.9	45	9	12	4
March	47.0	19.0	4.04	20.2	56	12	23	11
April	54.0	34.0	2.36	19.4	60	4	24	17
May	57.0	34.0	4.97	13.3	34	1	18	10
June	63.0	44.0	2.38	14.8	36	1	24	15
July	77.0	53.0	2.90	12.9	36	0	28	19
August	78.0	60.0	3.36	11.3	34	1	26	13
September	76.5	48.0	1.65	17.4	42	5	26	7
October	68.0	41.0	4.52	18.4	48	4	25	9
November	57.5	30.0	2.10	18.2	62	7	23	0
December	.....	.....	.....	.....	.....	.....	.....	.....
Averages	60.95	35.18	3.17	17.3	46	5	22	10

"The plantations started very well, all of the young trees taking root and the seed of the Maritime Pine germinated and came up 'as thick as it can stand, and * * * very fine and strong'."

This brief statement of the planting of the trees on Sable Island should impress the reader with the great care with which the plan was devised and the diligence with which the laborious planting was executed.

The Superintendent of Sable Island, R. J. Bouteillier, took a keen interest in the whole project and did all that a man could to insure its success. From his reports we learn that the trees began almost immediately to succumb to the severity of the climate. In his first

report he had to mention a discouraging loss. "I may say that almost everything planted seems to have taken root, those you first put in are budding freely, although I regret to say that on Friday last we had a moderate gale which lasted about 24 hours when the wind at times exceeded 40 miles an hour. I find that on the trees with soft leaves which had just opened, they were burned off as if from frost. The pines and spruces were not affected as far as could be observed."

In the fall of 1901, November 5th, Supt. Bouteillier wrote, "With regard to the condition of the trees the latter part of the summer was very dry, so much so that our vegetables are less than a half crop, so that you can see it must have been trying for the trees.

"*Rainfall*—

June, 2.38 inches; spread well over the whole month; fogs as well.
July, 2.90 inches; spread well over the whole month; fair; warmer.
August 1 to 13, 3.36 inches; no fogs; very warm.
September 8 to 30, 1.65 inches; no fogs; very warm; dry gales.
October 3 to 24, 3.60 inches; no fogs; warm; some high winds.

"You will see from this that the trying time was from August 13 to October 3, with only 1.65 of rain, no fogs and very warm weather for Sable Island. The thermometer averaged high all summer.

"This drought killed most of the weaklings, and the high winds burned the leaves off the deciduous trees between September 21 and 26, during which time it blew a continuous gale from S. W. around to north. After the gale subsided, the leaves were as though a fire had run close to the trees and scorched them. It was not cold, and we have had no frost yet.

"Many of these trees were very promising, and some of them are budding again since we have had rains. * * *

"Now, as I think I have shown you the worst side, I will show the other. All the evergreens looked dull during the drought, but after we had a few rains they improved wonderfully. All the pines, except the white pine *P. strobus* are looking splendidly and have made growth. The plants from the pine seed also grew well, but lately I noticed that many were turning a bluish cast. Some spruces survive, but few look promising. Arbor-vitae suffered much from drought, but there are many promising specimens in various localities.

"This general statement of the conditions of the trees applies to all planted in the various localities, but I think Gourdeau Park, 1½

miles east of main station, is most promising, and next is 4th station plot. In all plots planted the weeds and grass has grown freely, and I am satisfied now that this is best for the trees; it gives shelter. If the ground had been kept clear the drifting sand would abrade the bark, and it is very noticeable that trees do best where sheltered by grass or wild plants. In 'Gourdeau Park' there is shelter owing to the conformation of the ground, and the slopes have different exposures. I find where the slopes are exposed to the south-west and west winds (our prevailing winds) the trees are least promising."

In the following year, Dr. Saunders in an additional report[1] gave the latest news concerning the plantation on Sable Island. The first letter received in 1902 was written May 26. In this Mr. Bouteillier says, "I will give you the latest news of the trees. Our winter has been very mild; not much snow and not much frost. When a cold snap occurred it was followed by enough mild weather to take all the frost out of the ground. March was very mild; April was cold and windy, and that has continued up to a week ago. Many pines that seemed to stand the winter went red in March and April, and many that turned color have recovered and are putting out new buds. Survivors of Austrian, Mountain and Maritime pines are the most promising, and those that are not doing well are the small specimens; nearly all the larger ones planted are killed. A few spruces of all kinds survive, but they are not promising. Of the arbor vitae only a few are living. Juniper of both kinds nearly all dead; perhaps four or five survivors.

"Of the Maritime pines raised from the seed you brought, these were killed wherever they were scattered on the bare ground, but where they came up among the grass they are growing finely in this shelter, and there are thousands now green and putting out new buds. When sowing these I put them in thick, and after they came up I thought that in spots they were too thick; but this was their salvation, as the winds subsequently killed those on the outside, while those in the middle of these bunches were protected and have remained green.

"The deciduous trees were killed down from the top, some to the ground, others killed outright, but they are no exceptions, all are killed at least half way down. Included in these are *Pyrus prunifolia, P. baccata, Caragana arborescens* and Silver Poplar. All these deciduous sorts put out leaves a month ago, but lately we have had

[1] Saunders, Wm.: Reports from Sable Island in 1902, *l. c.* 56–58 (1902).

very high winds and all the leaves are more or less blighted, and some of the gooseberry and currant bushes are stripped. As I have mentioned before shelter is necessary here to success."

Supt. Bouteillier in the succeeding years continued to report on the condition of the young trees. Each year his report was more and more like a list of casualties due to the wind or the drought. In 1910, he made a careful census[1] of the survivors, finding 72 live.

During my visit to Sable Island in 1913, I was naturally much interested in the result of the tree planting, and carefully inspected each of the sites. I found 77 individuals. In all cases Supt. Bouteillier and I did not identify the trees as the same, but this is easy to understand as all of them are little dwarfed, blasted sprigs which never flower or fruit and which have very abnormal foliage. In all the important details we do agree, that out of the original planting in 1901 of 81,345 trees, as well as 50 pounds of seed of *Pinus maritima* there are now but 75 or so individuals alive, none of these exceeding the height of the sheltering Beach Grass. The attempt to forest these sand dunes was an absolute failure.

After a review of all the circumstances connected with this tree planting, no error in planning, no omission, no carelessness or accident in the planting is apparent. Large numbers of the trees that have successfully reclaimed similar areas were used, as well as a great variety of other possible trees and shrubs. It would seem that, although a few trees probably did grow on the island as late as 1633 the decreased size and height of the island since then had so reduced the amount of shelter from the fierce winds and storms that at present no trees could be made to stand the extreme climatic conditions. This remains, however, a distinct challenge to the foresters. It is hoped that sometime they may be able to meet it successfully.

Catalogue of the Vascular Plants.

In the following catalogue different fonts of type are used to distinguish the different elements of the flora.

Native plants are indicated by full-faced type.

Adventive plants are indicated by large and small capitals.

Discredited records are enclosed in brackets.

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[1] Dominion Experimental Farms, Report of the Director, Results of Experiments in Tree Planting on Sable Island, 54–55 (1910).

POLYPODIACEAE.

[ASPIDIUM SPINULOSUM Sw., var. DILATATUM (Hoffm.) Hook. The record of this fern for Sable Island is based on a communication from *H. T. Güssow*, but he writes that the plant was in "too fragmentary a condition to be placed in the Herbarium." The determination of this plant cannot now be verified.]

Polypodium vulgare L. Known only from one collection, on the old land at Island Pond, very rare, *J. Macoun* (C. no. 22,695).

Spores mature,—late July.

OSMUNDACEAE.

Osmunda cinnamomea L. Local, but abundant by the marshy shores of the fresh ponds at the eastern end of Wallace Lake, near Life Saving Station No. 3. Collected by *J. Macoun; H. T. Güssow; H. St. John*, no. 1,108 (H).

LYCOPODIACEAE.

Lycopodium inundatum L. Somewhat general in the wet dune hollows. *J. Macoun; H. T. Güssow; H. St. John*, nos. 1,109 and 1,110 (H).

Spores mature,—September.

PINACEAE.

PINUS MONTANA Mill. Six trees planted near Life Saving Station No. 3, in a grassy dune hollow have survived from the five thousand set out in 1901, but they are not over two feet in height, and are hidden by a luxuriant growth of *Ammophila*. *H. St. John*, no. 1,111 (H).

P. SYLVESTRIS L. A few trees out of the ten thousand planted in 1901 near Life Saving Station No. 4, are still living but they are overtopped by the *Ammophila*. *H. St. John*, no. 1,112 (H).

PICEA CANADENSIS (Mill.) B. S. P. One tree surviving at Life Saving Station, No. 4, from the planting in 1901 of 2,500 young trees. *H. St. John*, no. 1,113 (H).

[JUNIPERUS COMMUNIS recorded by *J. Macoun* (M. p. 216A) is probably of the var. *megistocarpa*.]

Juniperus communis L., var. **megistocarpa** Fernald & St. John, n. var., *J. communem*, var. *montanam* ramis prostratis foliis latis brevibus incurvantibus similans sed differt fructubus majoribus, 9–13 mm. diametro; seminibus majoribus, 5–7 mm. longis.

Resembling *J. communis* L., var. *montana* Ait. in its prostrate branches and short broad incurved leaves, but differing from it by its larger fruit, 9–13 mm. in diameter, and by its larger seeds, 5-7 mm. long.

NEWFOUNDLAND: serpentine and magnesian limestone barrens, northeastern base and slopes of Blomidon ("Blow-me-down") Mountains, Bay of Islands, August 21, 1910, *M. L. Fernald* and *K. M. Wiegand*, no. 2,422 (H).

QUEBEC, MAGDALEN ISLANDS: sand ridges back of the Narrows, Alright Island, August 21, 1912, *M. L. Fernald, Bayard Long*, and *Harold St. John*, no. 6,729 (TYPE in Gray Herb.); sand hills between East Cape and East Point, Coffin Island, *M. L. Fernald, Bayard Long*, and *Harold St. John*, no. 6,728 (H); sand dunes, Brion Island, Aug. 6, 1914, *Harold St. John*, no. 2,040 (H).

NOVA SCOTIA: Empetrum heaths near Gourdeau park, Sable Island, Aug. 23, 1913, *Harold St. John*, no. 1,114 (H); sprawling on sand dunes, Empetrum heaths, Whalepost, Sable Island, Aug. 30, 1913, *Harold St. John*, no. 1,115 (H).

Common on Sable Island on the dry slopes of the fixed dunes. This variety is probably the only one on the Island. In 1753 *Andrew Le Mercier* (L) described the Island as looking "all green in winter with the Juniper bushes."

In 1766 and 1767, *J. F. W. Des Barres* observed "juniper &c., in their season" (Atlantic Neptune, i. 68, 1777).

"A little ground juniper," is referred to by *J. B. Gilpin* (G. p. 18); "On y trouve, en fait de fruits, les baies du génévrier rampant" (T. p. 29).

Fr.—August and September.

[J. COMMUNIS L., var. DEPRESSA Pursh. Collected by *J. Macoun* and *H. T. Güssow*, and probably to be referred to the preceding variety.]

[J. NANA Willd. The plant mentioned by *Jonathan Dwight, Jr.*, (D. pp. 9 and 12) is probably *J. communis*, var. *megistocarpa*.]

J. horizontalis Moench. Dry sheltered slopes of the more permanent dunes. *J. Macoun* writes (M. p. 217A), "On one occasion I saw roots protruding from under a sand-hill over thirty feet high, and on digging them out found that they represented part of the remains

of a specimen of *Juniperus Sabina procumbens* (creeping juniper). It was rooted in a layer of black soil and when taken out showed that it had lain flat on the ground. Two of the roots, including the bark, measured 3⅝ and 3⅜ inches in diameter respectively, while the crown, where the branches began to spread was over seventeen inches in circumference or nearly six inches in diameter." Quite common on the old land, *J. Macoun* (C. no. 22,607); trailing on the sand dunes, Whalepost, *H. St. John*, nos. 1,116 and 1,117 (H).

Fl., Fr.—August and September.

[J. PROCUMBENS recorded by *J. Macoun* (M. p. 218A) is probably *J. horizontalis*.]

[J. SABINA PROCUMBENS recorded by *J. Macoun* (M. p. 217A) is *J. horizontalis*.]

TYPHACEAE.

Typha latifolia L. Local, growing only by the border of the fresh ponds at the east end of Wallace Lake, *J. Macoun;* and swampy edge of fresh-water pond near Life Saving Station No. 3, *H. St. John*, no. 1,118 (H).

Fr.—September.

SPARGANIACEAE.

Sparganium angustifolium Michx. Common in the permanent fresh-water ponds. *J. Macoun* (C. nos. 22,637 and 22,637a); *H. St. John*, nos. 1,119 and 1,120 (H).

Fl.—July and August. *Fr.*—August and September.

[S. SIMPLEX Huds. of *J. Macoun* is *S. angustifolium*.]

POTAMOGETONACEAE.

Potamogeton polygonifolius Pourret. Abundant in the fresh-water ponds. It will grow even in ponds that dry up for a part of the summer, but it probably does not fruit in these except in a wet season. In such exsiccated ponds the plant appears as a tight prostrate rosette of apparently sessile leaves. *J. Macoun* (C. no. 22,095) —for the first notice of this, see A. Bennett, Journal of Botany, xxx. 198 (1901). *H. St. John*, nos. 1,121 and 1,122 (H).

Fr.—August and September.

P. epihydrus Raf. Very common in the fresh ponds. *J. Macoun* (C. no. 22,073); *H. St. John*, no. 1,123 (H).

Fl.—July and August. *Fr.*—August and September.

P. bupleuroides Fernald. Common in brackish ponds. *J. Macoun* (C. no. 22,081); *H. T. Güssow* (E); *H. St. John,* no. 1,124 (H).

Fr.—August and September.

[P. PERFOLIATUS L. The specimens from Sable Island interpreted as this prove to be the American *P. bupleuroides.*]

[P. FRIESII Rupr. *J. Macoun's* collection (C. no. 22,097) proves to be *P. pusillus,* var. *capitatus.*]

P. pusillus L., var. **capitatus** Benn. Abundant in the brackish ponds. The type collection was made in pools, July 27, 1899, *J. Macoun* (C. no. 22,096 and 22,097); *H. St. John,* no. 1,125 (H).

Fl., Fr.—July and August.

[P. STURROCKII Benn. In Fryer's Potamogetons of the British Isles, 85 (1915) Arthur Bennett records this plant from Sable Island.]

P. pectinatus L. Common in the brackish pools. *J. Macoun* (C. nos. 22,071 and 22,072); *H. St. John,* no. 1,126 (H).

Fl., Fr.—August.

[P. PECTINATUS L., f. PSEUDOMARINUS Benn. In the Journal of Botany, xxxix. 199 (1901) Bennett makes the combination and credits the plant to Sable Island.]

[P. FILIFORMIS Pers. The collection by *J. Macoun* called this, is *P. pectinatus.*]

[RUPPIA MARITIMA L. *J. Macoun's* collection so named proves to be var. *longipes.*]

Ruppia maritima L., var. **longipes** Hagström. Abundant in Wallace Lake and the brackish ponds. *J. Macoun* (C. no. 22,635); *H. St. John,* no. 1,127 (H).

Fl., Fr.—August.

Zostera marina L. Common in Wallace Lake and washed up on the sea beaches. *J. Dwight, Jr.,* (D. pp. 13 & 40) mentions that it "abounds in the lagoon, and occurs as drift along its shores" and that the nest of the Ipswich Sparrow may be partly made of "eel-grass." Listed by *J. Macoun;* and *H. T. Güssow. H. St. John,* no. 1,128 (H).

GRAMINEAE.

Panicum huachucae Ashe. Occasional in the drier spots. *J. Macoun* (C. no. 22,708), labeled *P. implicatum; H. St. John*, nos. 1,129 and 1,130 (H).

Fr.—July and August.

[PANICUM IMPLICATUM Scribn. *J. Macoun's* collection was so labeled by Hitchcock and Chase, but the size of the spikelets and the character of the pubescence indicate that this plant should rather be treated as *P. huachucae*.]

ECHINOCHLOA CRUSGALLI (L.) Beauv. A garden weed at the Main Life Saving Station. *H. St. John*, no. 1,131 (H).

Fr.—September.

ANTHOXANTHUM ODORATUM L. Established on the drier, more stable parts of the island. *J. Macoun* (M. p. 218A) comments on the abundance of this species on the old land and argues that it appears native there, or at least is "a resident of such long standing that it has made itself at home in all suitable places." *H. St. John*, no. 1,132 (H).

Fr.—August.

PHLEUM PRATENSE L. Planted and well established near the Life Saving Stations. Observed by *J. Dwight, Jr.* (D. p. 12); collected by *J. Macoun; H. St. John*, no. 1,133 (H).

Fl., Fr.—August.

AGROSTIS ALBA L., var. VULGARIS (With.) Thurb. Cultivated near the stations, according to *J. Dwight, Jr.* (D. p. 12).

A. alba L., var. **maritima** (Lam.) G. F. W. Mey. Abundant in the dune hollows and at the margins of the fresh-water ponds. Collected by *J. Macoun; H. T. Güssow* (E); *H. St. John*, nos. 1,134 and 1,135 (H).

Fr.—August.

A.—[A collection by *J. Macoun* (C. no. 73,060) obviously belongs to the *alba* series, but I have been unable to place it to my satisfaction.

[A. HIEMALIS (Walt.) B. S. P. Both *Macoun* and *Güssow* list this species, but the plants are probably to be interpreted as of the var. *geminata*.]

A. hiemalis (Walt.) B. S. P., var. **geminata** (Trin.) Hitchc. A common plant, sprawling on the sand in the wet or the dry dune hollows. A. S. Hitchcock in his monograph of the North American Species of Agrostis, Bull. Bur. Plant Industry, lxviii. 43 (1905), cites one sheet with awnless spikelets, but this phase is apparently common. *H. St. John*, nos. 1,136 and 1,365 (H).

Fl., Fr.—August.

Ammophila breviligulata Fernald. (*A. arenaria* of Am. authors, not Link.) Abundant on all the drier parts of the island. Without doubt this is the most important plant on the island, for without it nothing would stay the erosive action of the wind, the storms, and the sea, and in a very short time the whole island would be reduced to a treacherous submerged bar, such as now extend out from either end of the island for more than fifteen miles. The Beach Grass does what none of the hundred odd species planted for this purpose succeeded in doing, for in most parts of the island it actually does anchor the sand and prevent the dunes from being dissipated by the winds. Even the earlier explorers such as *Des Barres*, mention "a great plenty of beach grass" (Atlantic Neptune, i. 68, 1777); in 1801, *Seth Coleman* found the soil of Sable Island, "of a nature to produce Beach Grass" (Rept. on Canadian Archives, 91, 1895). *John Macoun* (M. p. 215A): "All the sandhills are covered with sandgrass (*Ammophila*) and the wonderful vigour of this grass is well shown everywhere, but more particularly where the sand has just been deposited, or is in a raw state. I found one underground stem or stolon over twelve feet long which had sixty-four series of roots and no less than forty-seven tufts of leaves. The growing point was so hard and sharp that it might almost penetrate wood."

Another equally important use of the Beach Grass is that of providing the fodder that supports the gangs of wild and semi-domesticated ponies, as well as the cattle. To one familiar with it in other places the Beach Grass would seem like very poor fodder. On the sheltered slopes of many of the dunes, it grows here shoulder high, deep green, and juicy and succulent, so much so that I used to pull young shoots and chew them as I plodded over the soft sand and forced my way through the tangle of Beach Pea. It seemed to me that two factors might jointly or singly explain the unusually tender and succulent condition of the Beach Grass here: the cool, very moist climate; the regular cutting and harvesting of it as a hay crop over

large areas. During my stay at the Main Life Saving Station over sixty tons of this crop were stored away within the huge barns. Such a conspicuous plant was naturally observed by *J. Dwight, Jr.; J. Macoun; H. T. Güssow; H. St. John*, no. 1,137 (H).

Fl.—Late August and September.

[A. ARENARIA (L.) Link. All records belong to the American *A. breviligulata*.]

Deschampsia flexuosa (L.) Trin. On the drier parts of the island. *J. Macoun; H. T. Güssow* (E); *H. St. John*, no. 1,138 (H).

Fr.—July.

[D. ALBA R. & S. *Güssow's* specimen so named is *D. flexuosa*.]

AVENA SATIVA L. A weed at the Main Life Saving Station. *H. St. John*, no. 1,139 (H).

A. SATIVA L., var. ORIENTALIS (Schreb.) Richter. A weed at the Main Life Saving Station. *H. St. John*, no. 1,140 (H).

Danthonia spicata (L.) Beauv. On the old land, not rare. Found only by *J. Macoun* (C. no. 22,688).

Fr.—July.

Spartina Michauxiana Hitchc. Occasional at the borders of the brackish ponds. Found by *J. Macoun; H. T. Güssow; H. St. John*, nos. 1,141 and 1,142 (H).

Fl.—August.

POA ANNUA L. A weed near the stations. Collected by *J. Macoun* (C. no. 22,682).

Fl.—July.

P. PALUSTRIS L. (*P. triflora* Gilib.) Planted in a field near the Main Life Saving Station. *J. Macoun* (C. no. 22,681).

Fl.—July.

P. pratensis L. Generally distributed and frequent on the dry dunes. In 1753, *Andrew Le Mercier* (L) remarked, "there is some English Grass"; and in 1801, *Seth Coleman* found "some small spots of English Grass" (Rept. on Canadian Archives, 91, 1895).

Listed by *J. Macoun; H. T. Güssow; H. St. John*, no. 1,143 (H).

Fr.—August.

Glyceria Fernaldii (Hitchc.) St. John. (*G. pallida,* var. *Fernaldii* Hitchc.) In marshy spots, East End, *J. Macoun* (C. no. 22,684).

Fr.—Early August.

Festuca rubra L. Common on the drier parts of the island. Collected by *J. Macoun* (C. no. 22,686); *H. T. Güssow; H. St. John,* no. 1,144 (H).

Fl.—July. *Fr.*—August.

F. rubra L., var. **glaucescens** (Hegetschw. & Heer) Richter. Common on the nearly bare dunes where the coarse glaucous leaves form great tufts. *H. St. John,* nos. 1,145, 1,146, and 1,147 (H).

Fr.—August.

Bromus secalinus L. A fugitive weed. In meadow grass, rare. *J. Macoun* (C. no. 22,671).

Fr.—July.

Agropyron repens L. Established near the Life Saving Stations. Recorded by *J. Macoun; H. St. John,* no. 1,148 (H).

Fr.—August.

A. repens L., var. **pilosum** Scribn. On sand dunes remote from the Life Saving Stations and apparently native. *H. St. John,* no. 1,149 (H).

Fl.—August.

Hordeum jubatum L. A weed at the Main Life Saving Station. Reported by *J. Macoun; H. St. John,* no. 1,150 (H).

Fr.—August and September.

Elymus arenarius L., var. **villosus** E. Mey. (*E. arenarius* of Am. authors; *E. mollis* Trin.) Very rare on the island, occurring, as far as known, only along the top of a narrow ridge of dunes extending a short distance from the eastern end of Wallace Lake along the South Beach. This line of dunes has been rapidly washing away and the remnants are still exposed to the action of the storms. This grass luxuriates here, sending its culms up to a height of six feet or more, but the station is in great danger of being destroyed. *H. St. John,* no. 1,151 (H).

Fr.—September.

CYPERACEAE.

Eleocharis palustris (L.) R. & S. Abundantly fringing the borders of the permanent and semi-permanent fresh-water ponds.

J. Macoun (C. nos. 77,185, 77,186, 77,163, 22,648); *H. T. Güssow; H. St. John*, no. 1,152 (H).

Fl.—August.

E. palustris (L.) R. & S., var. **glaucescens** (Willd.) Gray. Even more common than the preceding, but found sprawling on the drier sand flats or in nearly bare dune hollows. *J. Macoun* (C. nos. 22,640, 22,647, and 77,187); *H. St. John*, nos. 1,153, 1,154, and 1,155 (H).

Fl.—August. *Fr.*—August and September.

Scirpus nanus Spreng. Found only by the brackish margins of Wallace Lake. *J. Macoun* (C. no. 22,649); *H. T. Güssow; H. St. John*, no. 1,156 (H).

Fl., Fr.—September.

S. americanus Pers. Common in the dune hollows. *J. Macoun* (C. no. 22,632); *H. T. Güssow; H. St. John*, no. 1,157 (H).

Fl.—August.

S. acutus Muhl. (*S. occidentalis* (Wats.) Chase.) Brackish and nearly fresh ponds near Wallace Lake. Some of the specimens have been named *S. validus* but none seems to belong in that species. *J. Macoun* (C. no. 22,633) is very young material. *H. T. Güssow's* collection has well developed achenes only 2 mm. long, but the spikelets are borne for the most part in glomerules, so the plant is treated as of this species. *H. St. John*, nos. 1,158 and 1,159 (H) do not have long spikelets, but the achenes are large, 2.5 mm. long, and the scales are long and overlapping. These specimens with a mingling of characters of *S. validus* and of *S. acutus* raise the question as to the distinctness of these two species.

Fr.—September.

[S. OCCIDENTALIS (Wats.) Chase is *S. acutus*.]

[S. VALIDUS Vahl. The specimens from Sable Island that have been called this seem better treated as *S. acutus*.]

S. campestris Britton, var. **paludosus** (A. Nelson) Fernald. Brackish ponds near Wallace Lake. *J. Macoun* (C. no. 22,634); *H. St. John*, no. 1,160 (H).

Fr.—September

Carex hormathodes Fernald. Wet margins of the fresh ponds. common. *J. Macoun; H. St. John*, nos. 1,161, 1,162, and 1,163 (H).

Fr.—August and September.

[C. STRAMINEA Willd. The specimen so labeled by *J. Macoun* is *C. hormathodes.*]

C. silicea Olney. Uniformly distributed on the dunes and drier sand flats. *J. Macoun; H. St. John,* no. 1,164 (H).

Fl., Fr.—August.

C. echinata Murr. (*C. stellulata* Good.) Borders of ponds and wet dune hollows. *J. Macoun* (C. no. 23,037); *H. St. John,* no. 1,165 (H).

Fr.—July and August.

C. echinata Murr., var. **cephalantha** Bailey. Found at the East End, *J. Macoun* (C. no. 77,162 and 22,065).

Fr.—July.

C. canescens L., var. **disjuncta** Fernald. Common along the pond margins and in the wet dune hollows. *J. Macoun* (C. nos. 23,070 and 23,071); *H. St. John,* no. 1,166 (H).

Fr.—July to September.

C. deflexa Hornem. Found only by *J. Macoun* (C. no. 23,089).

Fr.—July.

C. Oederi Retz., var. **pumila** (Coss. & Germain) Fernald. Wet usually turfy borders of brackish ponds. *J. Macoun* (C. no. 23,088); *H. St. John,* no. 1,167 (H).

Fr.—July and August.

ERIOCAULACEAE.

Eriocaulon septangulare With. (*E. articulatum* (Huds.) Morong.) Very abundant at the wet margins of the fresh-water ponds. *J. Macoun; H. St. John,* no. 1,168 (H).

Fr.—August.

JUNCACEAE.

Juncus bufonius L. Wet sand near Wallace Lake. Collected by *J. Macoun; H. T. Güssow; H. St. John,* no. 1,169 (H).

Fl., Fr.—August.

J. bufonius L., var. **halophilus** Buchenau & Fernald. Brackish beach of Wallace Lake, *H. St. John,* no. 1,170 (H).

Fl., Fr.—August.

J. tenuis Willd. Common on the sand dunes. Collected by *J. Macoun; H. T. Güssow; H. St. John*, nos. 1,171 and 1,172 (H).

Fl., Fr.—August and September.

[J. Baltic recorded by *J. Macoun* (M. p. 218A) is *J. balticus*, var. *littoralis*.]

J. balticus Willd., var. **littoralis** Engelm. Very common in the wet or dry dune hollows. Collected by *J. Dwight, Jr.* (D. p. 12); *J. Macoun; H. T. Güssow; H. St. John*, no. 1,173 (H).

Fl., Fr.—August.

J. canadensis J. Gay. Common in the dune hollows. *J. Macoun; H. T. Güssow; H. St. John*, nos. 1,174 and 1,175 (H).

Fl.—August. *Fr.*—August and September.

J. pelocarpus Mey., var. **sabulonensis**, n. var., prostratus omnibus partibus forma typica multo minor; foliis teretibus, septis vix visibilibus; floribus in cymam contractam aggregatis; capsulo 2.5–3.5 mm. longo, 1–1.5 mm. diametro igitur crassitudine dimidium longitudinis subaequante.

Prostrate, very much reduced in all parts: the septa scarcely showing on the terete leaf blades: flowers more nearly approximate in the reduced cyme: capsule 2.5–3.5 mm. long, 1–1.5 mm. wide, averaging nearly one half as wide as long, while in *J. pelocarpus* the capsules are 3–4 mm. long, and 1–1.5 mm. wide, averaging one third as wide as long. The bulbiferous form is not known to occur in the var. *sabulonensis*.

Nova Scotia: shallow ponds, Sable Island, Aug. 16, 1899, *J. Macoun* (C. no. 22,631); sprawling in wet dune hollow, Sable Island, Aug. 30, 1913, *H. St. John*, no. 1,176 (type in Gray Herb.).

J. bulbosus L. Common along the marshy borders of freshwater ponds. *J. Macoun* (C. no. 22,623) see J. M. Macoun, Ottawa Nat. xv. (Contributions to Canadian Bot. xiv.) 79 (1901); *H. St. John*, no. 1,177 (H).

Fl., Fr.—August.

[J. articulatus L. of *J. Macoun* is *J. pelocarpus*, var. *sabulonensis*.]

J. articulatus L., var. **obtusatus** Engelm. Very common in the wet dune hollows. *H. T. Güssow* (E); *H. St. John*, nos. 1,178, 1,179, and 1,180 (H).

Fr.—August and September.

Luzula campestris (L.) DC., var. **acadiensis** Fernald. See Rhodora, xix. 38 (1917). Common on the dry dunes that are fixed

by semi-abundant vegetation. *H. St. John*, nos. 1,181 and 1,182 (H). All records for the var. *multiflora* should probably go here.

Fr.—August.

[JUNCOIDES CAMPESTRE (L.) recorded by *J. Dwight, Jr.*, (D. p. 12) is treated as *Luzula campestris*, var. *acadiensis*.]

LILIACEAE.

Smilacina stellata (L.) Desf. Found throughout, on the drier dunes that are anchored by a covering of larger vegetation. *J. Dwight, Jr.; J. Macoun; H. T. Güssow; H. St. John*, no. 1,183 (H).

Fr.—August, uncommon.

IRIDACEAE.

Iris versicolor L. Common by the wet pond margins. *John Rose*, in 1633, saw "flags by the ponds" (Winthrop, John: Hist. of N. E., ed. James Savage, i. 162 (1825)). *J. B. Gilpin* records (G. p. 18), "The wild rose, blue lily and wild pea enamel the valleys." It has seemed evident to me that Gilpin's "blue lily" must be *Iris versicolor*. *J. Dwight, Jr.* (D. p. 14) refers to the "blue lilies," "that are said to bloom later in the season, I failed to obtain any specimens." *J. Macoun; H. T. Güssow; H. St. John*, nos. 1,184 and 1,185 (H).

Fl., Fr.—August and September.

Sisyrinchium gramineum Curtis. Abundant in the wet dune hollows all over the island. Recorded as *S. graminoides* Bicknell by Bicknell, Bull. Torr. Bot. Club, xxvii. 239 (1900). *J. Macoun* (C. nos. 76,855, 76,856, and 76,857); *H. St. John*, no. 1,186 (H).

Fl., Fr.—July and August.

[S. ANGUSTIFOLIUM Mill. All records of this from Sable Island should be interpreted as *S. gramineum*.]

ORCHIDACEAE.

Habenaria bracteata (Willd.) R. Br. In boggy spots near Island Pond. Found only by *J. Macoun* (C. no. 22,614). This specimen has been recorded by Ames as *H. viridis* R. Br., var. *bracteata* Gray, in his Orchidaceae, iv. 24 (1910).

Fr.—July.

[H. VIRIDIS R. Br., var. BRACTEATA Gray recorded by Ames is *H. bracteata*.]

H. clavellata (Michx.) Spreng. Occasional on turfy banks near the fresh-water ponds. *J. Macoun; H. T. Güssow* (E); *H. St. John*, nos. 1,187 and 1,188 (H).

Fl., Fr.—September.

H. lacera (Michx.) R. Br. Occasional on turfy banks and in the wet dune hollows. *J. Macoun; H. T. Güssow* (E); *H. St. John*, nos. 1,189, 1,190, 1,191, and 1,192 (H).

Fl.—August. *Fr.*—September.

Calopogon pulchellus (Sw.) R. Br. Frequent in the wet dune hollows. *J. Macoun; H. T. Güssow; H. St. John*, nos. 1.193 and 1,194 (H).

Fl.—August.

C. pulchellus (Sw.) R. Br., forma **latifolius** n. f., foliis oblongo-vel elliptici-lanceolatis, 7–11 cm. longis, 1.3–2.8 cm. latis.

Leaves oblong- or elliptic-lanceolate, 7–11 cm. long, 1.3–2.8 cm. wide.

Nova Scotia: wet dune hollow, Sable Island, Aug. 27, 1913, *H. St. John*, no. 1,195 (TYPE in Gray Herb.).

Spiranthes Romanzoffiana Cham. In damp boggy spots. Found only by *J. Macoun* (C. no. 22,603).

Fl.—July.

SALICACEAE.

Salix viminalis L. A planted specimen has survived at Life Saving Station No. 3, and attained a height of six feet. It showed no signs of having fruited. *H. St. John*, no. 1,196 (H).

MYRICACEAE.

Myrica carolinensis Mill. Scattered clumps on the dry dunes. *J. Macoun; H. T. Güssow; H. St. John*, no. 1,197 (H).

Fr.—August.

M. cerifera L. Recorded by *J. Dwight, Jr.* (D. pp. 13 & 42) and by *J. Macoun* (M. p. 218A), but the specimens are undoubtedly *M. carolinensis*.

BETULACEAE.

Betula pendula Roth. Planted in 1901, and one tree surviving near Life Saving Station No. 4, although not equalling the Sand Grass (*Ammophila*) in height. *H. St. John*, no. 1,198 (H).

B. ALBA L. (B. PUBESCENS Ehrh.) Two thousand trees were planted in 1901 in Gourdeau Park and a few are still growing there, but are not over two feet in height. *H. St. John*, no. 1,199 (H).

POLYGONACEAE.

Rumex Britannica L. Occurring only along the swampy margins of the fresh-water ponds extending beyond the eastern end of Wallace Lake, near Life Saving Station No. 3. *J. Macoun* (C. no. 22,595); *H. St. John*, no. 1,200 (H).

Fl.—August. *Fr.*—September.

[R. OCCIDENTALIS Wats. The plant so listed by *J. Macoun* is *R. Britannica.*]

R. CRISPUS L. Introduced and common near the Life Saving Stations, rare elsewhere. *J. Macoun; H. St. John*, nos. 1,201, 1,202, and 1,203 (H).

Fr.—August and September.

R. maritimus L., var. **fueginus** (Phil.) Dusén. See St. John Rhodora, xvii. 81 (1915). Abundant on the brackish beaches of Wallace Lake, and appearing as a weed in the gardens through the use as a fertilizer of sea-weed collected on the beach of the lake. *J. Macoun* (C. no. 22,549); *H. St. John*, nos. 1,204, 1,205, 1,206, 1,207, and 1,208 (H).

Fl.—August. *Fr.*—September.

R. ACETOSELLA L. Thoroughly established on the drier parts of the island, especially near the Life Saving Stations. Mentioned by *J. Dwight, Jr.* (D. pp. 13 & 42). Listed by *J. Macoun;* and *H. T. Güssow; H. St. John*, no. 1,209 (H).

Fl.—August.

Polygonum Raii Bab. Wet dune hollow, possibly brackish. Known only from the collection, *H. St. John*, no. 1,210 (H).

Fl.—August.

[P. FOWLERI Robinson. The plant so listed by *J. Macoun* is *P. aviculare.*]

P. AVICULARE L. Well established near the Life Saving Stations. *J. Macoun* (C. no. 22,599, also as door-weed M. p. 218A); *H. St. John*, nos. 1,211, and 1,212 (H).

Fl., Fr.—August and September.

P. LAPATHIFOLIUM L. In a potato field, East End Post, *J. Macoun* (C. no. 22,590).

Fl., Fr.—July.

P. LAPATHIFOLIUM L., var. PROSTRATUM Wimmer. Brackish beach of Wallace Lake near the Main Life Saving Station. *H. St. John*, no. 1,361 (H). Material of this number was distributed under an unpublished manuscript name.

Fl., Fr.—September.

P. SCABRUM Moench (P. TOMENTOSUM Schrank). A weed at the Main Life Saving Station. *H. St. John*, no. 1,213 (H).

Fl., Fr.—August.

P. HYDROPIPER L. Introduced around buildings, Main Life Saving Station, *J. Macoun* (C. no. 22,582).

Fl., Fr.—August.

P. PERSICARIA L. A weed at the Main Life Saving Station. *H. St. John*, no. 1,214 (H).

Fl., Fr.—August.

P. hydropiperoides Michx., var. **psilostachyum**, n. var., *P. hydropiperoidem* simulans sed differt ocreolis glabris eciliolatis, marginibus pellucidis; foliis glabris vel glabratis brevioribus, 4–8 cm. longis, 0.8–2.4 cm. latis.

Differing from *P. hydropiperoides*, which has leaves pubescent at least on the midrib and near the margins and often throughout, in having glabrous eciliolate ocreolae which have scarious transparent margins, and in the glabrous or glabrate comparatively short leaves, 4–8 cm. long, 0.8–2.4 cm. wide.

NOVA SCOTIA: in muddy ponds and by their borders, Sable Island, Aug. 3, 1899, *J. Macoun* (C. no. 22,583); Sable Island, Sept., 1911, *H. T. Güssow* (E); shallow fresh-water pond, Sable Island, Aug. 16, 1913, *H. St. John*, no. 1,215 (H); swampy edge of fresh-water pond, Sable Island, Aug. 23, 1913, *H. St. John*, no. 1,216 (TYPE in Gray Herb.). WASHINGTON: White Salmon, Oct., 1880, *W. N. Suksdorf*, no. 483 (H); Columbia River Bottom, Klickitat Co., Oct. 12, 1881, *W. N. Suksdorf*, no. 56 (H & P).

To the last-cited specimen there is a reference in a letter from W. N. Suksdorf to Dr. Sereno Watson, dated Oct. 20, 1881. "It is an indigenous plant no doubt, very frequent on low bottom lands near the Columbia River; perennial, the prostrate stems rooting at the joints, the flowering portion mostly ascending." On the list is a note in Dr. Watson's handwriting, "but bracts not ciliate." So it

appears that Dr. Watson had noticed one of the characters of the var. *psilostachyum*, but he took no action.

P. CONVOLVULUS L. A weed at the Main Life Saving Station. *J. Macoun; H. St. John*, no. 1,217 (H).

Fl., Fr.—August.

CHENOPODIACEAE.

Chenopodium rubrum L. Common on the brackish beach of Wallace Lake. *J. Macoun; H. T. Güssow; H. St. John*, no. 1,218 (H).

Fr.—September.

C. ALBUM L. A weed at the Main Life Saving Station. *J. Macoun;* (also as "lamb's quarter" M. p. 218A); *H. St. John*, no. 1,219 (H).

Fl.—August.

A narrow-leaved form is also established at the Main Life Saving Station. *H. St. John*, no. 1,220 (H).

Fl.—September.

Atriplex patula L., var. **hastata** (L.) Gray. Common on the wet brackish beach of Wallace Lake. *J. Macoun; H. T. Güssow; H. St. John*, no. 1,221 (H).

Fr.—September.

CARYOPHYLLACEAE.

Spergularia leiosperma (Kindberg) F. Schmidt. See Fernald & Wiegand, Rhodora, xii. 162 (1910). Common on the brackish sandy beach of Wallace Lake. *J. Macoun* (C. no. 21,151); *H. T. Güssow* (E); *H. St. John*, nos. 1,222 and 1,223 (H).

Fl.—August. *Fr.*—August and September.

[S. CANADENSIS (Pers.) Don of *J. Macoun* and *H. T. Güssow* is *S. leiosperma*.]

SPERGULA ARVENSIS L. A weed at the Main Life Saving Station. *J. Macoun; H. St. John*, nos. 1,224 and 1,225 (H).

Fl.—August and September. *Fr.*—September.

Sagina procumbens L. Frequent in the wet dune hollows. *J. Macoun; H. St. John*, no. 1,226 (H); *H. S. Glazebrook* (H).

Fl.—June to August. *Fr.*—July to August.

Arenaria lateriflora L., var. **typica** (Regel) St. John. Turfy banks and grass-covered dunes. *J. Macoun; H. T. Güssow; H. St. John*, no. 1,227 (H).

Fr.—August.

[A. GROENLANDICA (Retz.) is recorded by *J. Dwight, Jr.* (D. p. 14). I searched for this specimen in the Herbarium of the New York Botanical Garden, but could not find it. I strongly suspect the plant is *A. lateriflora*, var. *typica*.]

[A. PEPLOIDES L. Recorded by *J. Dwight, Jr.* (D. p. 14) and by *J. Macoun* (M. p. 213A) is probably to be treated as of the var. *robusta*.]

A. peploides L., var. **robusta** Fernald. See Rhodora, xi. 114 (1909). Very abundant at the top of the beaches, on the dry bars and sand spits. As is the case with *Ammophila*, this plant plays an important part in the affairs of the island. The terns of three sorts which nest on the sand flats, almost invariably place their nests in a clump of the *Arenaria*. From a somewhat unusual cause, a botanist finds great difficulty in collecting good specimens of this abundant plant. For weeks he can inspect clump after clump of the *Arenaria* and find that in each case there has been an earlier visitor, and a very destructive one. This succulent, free-growing plant is the choicest fodder of the "gangs" of wild ponies that roam the island, and as these total anywhere from two to four hundred ponies, it is easy to see how they would make serious depredations on any plant growing only in a limited portion of an area of about fifteen square miles. Taking the hint from the ponies, I myself tried munching a sprig of the *Arenaria*, and found it of good texture, juicy and with a strong but not unpleasant taste resembling that of cabbage. *J. Dwight, Jr.* (D. p. 14); *J. Macoun; H. T. Güssow; H. St. John*, no. 1,228 (H).

Fr.—August.

STELLARIA GRAMINEA L. A weed, established at the Main Life Saving Station. *J. Macoun; H. St. John*, no. 1,229 (H).

Fl., Fr.—August.

S. MEDIA (L.) Cyrill. A weed, thoroughly established at the Main Life Saving Station. *J. Macoun* (C. no. 21,154); *H. St. John*, no. 1,230 (H).

Fl., Fr.—July and August.

[S. MEDIA (L.) Cyrill., ssp. NEGLECTA Weihe. Theo. Holm, in the Ottawa Nat. XV. 37–41 (1901), records this from Sable Island, basing it on *J. Macoun's* collection (C. no. 21,154). I have examined this specimen and can see no justification for separating it from *S. media*.]

[S. MEDIA (L.) Cyrill., var. PROCERA Klett & Richter. Recorded in Gray's Man. ed. 7, 382 (1908), is to be treated as *S. media*.]

CERASTIUM VULGATUM L. Established on the dry dunes near the Life Saving Stations. *J. Macoun; H. St. John*, no. 1,231 (H); *H. S. Glazebrook* (H).

Fl.—June to August. *Fr.*—August.

SILENE NOCTIFLORA L. A weed at Life Saving Station No. 3. *H. St. John*, no. 1,232 (H).

Fr.—September.

PORTULACACEAE.

[MONTIA FONTANA L. Listed by *J. Macoun*, but the specimen is *Tillaea aquatica*.]

PORTULACA OLERACEA L. A weed, observed in the garden of the Main Life Saving Station.

NYMPHAEACEAE.

Nymphozanthus variegatus (Engelm.) Fernald. See Rhodora, xxi. 187 (1919). Abundant in the small ponds which at all times are absolutely isolated from the sea. *J. Macoun* (C. no. 21,142); *H. St. John*, no. 1,233 (H).

Fl.—July and August. *Fr.*—August.

[NUPHAR ADVENA Ait. All records from the island are to be considered as *Nymphozanthus variegatus*.]

RANUNCULACEAE.

Ranunculus Cymbalaria Pursh. Common on the brackish beaches. *J. Macoun* (C. no. 21,130); *H. St. John*, no. 1,234 (H).

Fl., Fr.—July to September.

[R. CYMBALARIA Pursh, var. ALPINUS Hook. recorded by *J. Macoun*. The specimen is better treated as *R. Cymbalaria*.]

R. reptans L. (*R. Flammula*, var. *reptans* (L.) Meyer.) Very common in the wet dune hollows. *J. Macoun; H. T. Güssow; H. St. John*, no. 1,235 (H).

Fl., Fr.—August.

R. REPENS L. A rare introduction. Found only by *J. Macoun* (C. no. 21,132).

Fr.—August.

R. ACRIS L. A weed at the Main Life Saving Station. *J. Macoun; H. St. John*, no. 1,236 and 1,237 (H).

Fl.—August and September. *Fr.*—September.

[THALICTRUM DIOICUM L. Listed by *J. Macoun*, and *H. T. Güssow*, but the specimens are *T. polygamum*, var. *hebecarpum*.]

Thalictrum polygamum Muhl., var. **hebecarpum** Fernald. Common on the stable, well vegetated dunes. *J. Dwight, Jr.* (D. p. 13) mentions as one of the weeds "*Thalictrum* sp.?" As there is but one species of Meadow Rue growing on the island, and that very commonly, we can feel reasonably sure that J. Dwight, Jr., found *T. polygamum*, var. *hebecarpum*. It is hard to understand, however, why he called it a weed. *J. Macoun* (C. no. 21,134); *H.T. Güssow* (E); *H. St. John*, no. 1,238 (H).

Fl.—July and August. *Fr.*—August and September.

[T. ZIBELLINUM Greene. In the Ottawa Naturalist, xxiv. 30 (1910) this new species was published, based upon the collection of *J. Macoun* (C. no. 21,134). I have examined the suite of specimens collected under this number and feel no hesitation about stating that the plant should be treated as *T. polygamum*, var. *hebecarpum*.]

Coptis trifolia (L.) Salisb. On the more permanent, grass-covered dunes. *J. Macoun; H. St. John*, no. 1,239 (H); *H. S. Glazebrook* (H).

Fl.—June.

CRUCIFERAE.

CAPSELLA BURSA-PASTORIS (L.) Medic. A weed at the Main Life Saving Station. *J. Macoun;* (also as "shepherd's purse" M. p. 218 A); *H. St. John*, no. 1,240 (H).

Fl., Fr.—August.

Cakile edentula (Bigel.) Hook. Common on the sea strands and along the brackish beach of Wallace Lake. *J. Macoun; H. T. Güssow* (E); *H. St. John,* no. 1,241 (H).

Fl., Fr.—August.

Raphanus sativus L. Established at the Main Life Saving Station. *H. St. John,* no. 1,242 (H).

Fl.—August.

Brassica arvensis (L.) Ktze. A weed near the Life Saving Stations. *J. Macoun; H. St. John,* no. 1,243 (H).

Fl.—August.

Sisymbrium officinale (L.) Scop. A weed near Life Saving Station, No. 3. *H. St. John,* no. 1,244 (H).

Fl., Fr.—September.

DROSERACEAE.

Drosera rotundifolia L. Common in the wet dune hollows and on the margins of the fresh-water ponds. *J. Macoun; H. T. Güssow; H. St. John,* no. 1,245 (H).

Fl., Fr.—August.

D. longifolia L. In wet sand and bogs, found only by *J. Macoun* (C. no. 21,187).

Fl.—August.

CRASSULACEAE.

Tillaea aquatica L. Forming pure mats at the wet borders of the fresh-water ponds. *J. Macoun* (C. no. 21,156); *H. St. John,* nos. 1,246 and 1,247 (H).

Fl., Fr.—July and August.

The three collections of this plant from Sable Island show, in the same clump, plants which have "nearly sessile" flowers and fruit, and other plants bearing nearly sessile flowers in the upper axils and peduncled ones in the lower axils. According to our present American treatments, we should have to recognize in these apparently pure clumps two species. An examination of the American material of *Tillaea Vaillantii* Willd. shows that in every known locality *T. aquatica* occurs and occurs more abundantly, that its characters are a matter of degree, not strictly definable. Consequently the author feels that *T. Vaillantii* of American authors should be treated as identical with *T. aquatica.* The inference must not be drawn that

the author is discounting *T. Vaillantii* Willd. of Europe, which is a valid and distinct species.

SAXIFRAGACEAE.

HYDRANGEA PANICULATA Sieb., var. GRANDIFLORA Sieb. From the twenty-five planted in 1901, one is still surviving at Life Saving Station, No 3. *H. St. John*, no. 1,248 (H).

ROSACEAE.

Pyrus arbutifolia (L.) L. f., var. **atropurpurea** (Britton) Robinson. Common on the more permanent, well vegetated parts of the island. *J. Macoun* (C. no. 21,174); *H. St. John*, nos. 1,249 and 1,250.

Fr.—August.

[P. MELANOCARPA (Michx.) Willd. Listed by *H. T. Güssow* on the basis of a field determination. It is doubtless to be considered as *P. arbutifolia*, var. *atropurpurea*.]

[FRAGARIA VIRGINIANA Duchesne. Listed by *H. T. Güssow* on the basis of a field determination. The plant was undoubtedly of the var. *terrae-novae*.]

Fragaria virginiana Duchesne, var. **terrae-novae** (Rydb.) Fernald & Wiegand. See Rhodora, xiii. 106 (1911). Common on the semi-permanent dunes, and in the turfy hollows. *Andrew Le Mercier* in 1753 described the island as looking all "red in summer with the large Strawberries." We must remember, however, that by means of this article Le Mercier hoped to sell the island, which was then his private property. *J. B. Gilpin* in 1858 (G. p. 18) mentioned the "Strawberries." Similarly *J. C. Taché* speaks of "les fraises," (T. p. 29). *J. Dwight, Jr.; J. Macoun* (C. nos. 21,172 and 21,182); *H. T. Güssow; H. St. John*, no. 1,251 (H).

Fl.—June.

[F. CANADENSIS Michx. recorded by *J. Dwight, Jr.*, is *F. virginiana*, var. *terrae-novae*.]

[POTENTILLA MONSPELIENSIS L. The records of *J. Macoun*, and *H. T. Güssow* should be for var. *norvegica*.]

Potentilla monspeliensis L., var. **norvegica** (L.) Rydb. Common around the margins of the fresh-water ponds. *J. Macoun* (C. no. 21,176); *H. T. Güssow* (E); *H. St. John*, nos. 1,252 and 1,253 (H).

Fl., Fr.—August and September.

P. palustris (L.) Scop. Occasional on the wet pond margins. Listed by *J. Macoun; H. St. John*, nos. 1,254, 1,255, and 1,362 (H).

Fr.—September.

P. palustris (L.) Scop. approaching var. **parvifolia** (Raf.) Fernald & Long. See Rhodora, xvi. 10 (1914). Swampy edge of a fresh pond, near the east end of Wallace Lake, growing in the same colony with *P. palustris*. *H. St. John*, no. 1,256 (H).

Fr.—September.

P. tridentata Ait. Occasional on the sand dunes. Listed by *J. Macoun;* and *H. T. Güssow*. *H. St. John*, no. 1,257 (H).

Fl.—August.

P. pacifica Howell. See Rhodora xi. 8 (1909). Abundant along the brackish beaches of Wallace Lake. *H. T. Güssow* (E); *H. St. John*, no. 1,258 (H).

Fl., Fr.—August.

[P. Anserina L. Listed by *J. Macoun*, but is probably *P. pacifica.*]

Rubus hispidus L. Known from this area only by a small fragment collected by *J. Macoun* (C. no. 21,139 in part) (H).

Rubus arcuans Fernald & St. John, n. sp., arcuans deinde prostratus; turionibus aculeis 3–4.5 mm. longis robustis curvatis retrorsis valde armatis; foliis plerumque trifoliolatis aliquando quinquefoliolatis vel subquinquefoliolatis; foliolis obovatis acutis vel suborbiculatis coriaceis supra nigri-viridibus subtus pallidi-viridibus grosse dupliciterque serratis, 3.5–8.5 cm. longis, 2–6.2 cm. latis, costa media subter aculeis raris instructa, costis minute pilosis: ramis floriferis prostratis; foliis trifoliolatis vel simplicibus; foliolis coriaceis obovatis grosse dupliciterque serratis 2.5–8 cm. longis, 1.5–7 cm. latis, costis subter pilosis; inflorescentia racemosa vel compositi-racemosa foliosa interrupta, 0.6–3.2 dm. longa; pedicellis 1.5–4 cm. longis, densissime pilosis aculeis aliquando glandulis paucis stipitatis munitis; sepalis lanceolati-ovatis; petalis albis spatulatis, 7–11 mm. longis; fructibus globosis.

Arching and becoming prostrate: canes of the first year thickly beset with strong curved retrorse bristles, which are 3–4.5 mm. in length: the leaves normally 3-foliolate, but sometimes 5-foliolate or imperfectly so; the leaflets obovate with an acute tip or nearly orbicular, coriaceous, dark green above, light green beneath, coarsely doubly serrate, 3.5–8.5 cm. long, 2–6.2 cm. wide; the midrib armed beneath with scattered prickles; the veins finely pilose: fruiting canes prostrate, with trifoliolate or simple leaves; the coriaceous leaf-

lets obovate, pilose on the veins, coarsely and doubly serrate, 2.5–8 cm. long, 1.5–7 cm. wide: the inflorescence an interrupted leafy subcylindric simple or compound raceme, 0.6–3.2 dm. long; pedicels 1.5–4 cm. long, very densely pilose, armed with prickles and at times with a few stipitate glands; sepals lance-ovate; petals white, spatulate, 7–11 mm. long; fruit globose.

PRINCE EDWARD ISLAND: dry open soil, Dundee, Aug. 26, 1912, *M. L. Fernald, Bayard Long,* and *Harold St. John,* no. 7,652 (TYPE in Gray Herb.); railroad banks, Mt. Stewart, July 30, 1912, *M. L. Fernald, E. B. Bartram, Bayard Long,* and *Harold St. John,* nos. 7,655 and 7,654 (H); Miscouche, Sept. 12, 1909, *W. H. Blanchard,* no. 806 (H). NOVA SCOTIA: Pictou, July 22, 1907, *C. B. Robinson,* no. 574 (H). SABLE ISLAND: July 24, 1899, *J. Macoun* (C. no. 21,193 in part); sprawling among *Ammophila* on sand dunes, Aug. 26, 1913, *H. St. John,* no. 1,259 (H). MASSACHUSETTS: damp dune hollows east of Race Point Life Saving Station, Provincetown, August 2, 1919, *Fernald & Long,* no. 18,585.

Rydberg cites with some doubt the Macoun nos. 21,183 and 21,193 from Sable Island as *Rubus nigricans* × *recurvans,* Bull. Torr. Bot. Cl. xlii. 476 (1915); and on the following page he cites no. 21,193 as *Rubus nigricans* × *procumbens.* On p. 478 he cites the C. B. Robinson no. 574 as *Rubus hispidus* × *nigricans.*

An anonymous writer reports "blackberries" on Sable Island (All the Year Round, lx. 521, 1890).

This species of the Maritime Provinces and Cape Cod differs from *R. tardatus* Blanchard by having broadly obovate more coriaceous leaflets, abundant strong prickles, densely villous and ordinarily glandless but bristly pedicels; instead of the broadly lanceolate leaflets tapering to each end, the less numerous weaker prickles, and the less pubescent and copiously glandular pedicels of that species; from *R. setosus* Bigel. by having strong prickles thickened at the base and broad obovate bluntly serrate dark green coriaceous leaflets, instead of fine setae and narrower oblanceolate sharply serrate paler leaflets, long-trailing tips of the branches and essentially glandless pedicels; from *R. hispidus* L. by its much coarser habit, strong prickles, larger leaves, and its more elongate coarser inflorescence with larger corolla and larger seeds (averaging 3 mm. in length), the comparatively delicate *R. hispidus* having fine weak prickles and more rounded smaller leaflets and small fruits with seeds averaging 2 mm. in length.

Fl., Fr.—August.

Rosa virginiana Mill. Very common on the more stable sand dunes throughout the island. "The wild rose" is mentioned by *J. B. Gilpin* (G. p. 18). *J. C. Taché* says, "La plus belle plante d'ornement est le rosier sauvage, qui vient à merveille, sur cette

terre si souvent enveloppée de brouillards et visitée par les orages" (T. p. 29). *J. Macoun; H. T. Güssow; H. St. John*, no. 1,260 (H).

Fr.—August and September.

[R. NITIDA Willd., is a tentative determination put on material in young leaf collected by *J. Dwight, Jr.* (D. p. 13). The plant is doubtless *R. virginiana.*]

LEGUMINOSAE.

CYTISUS SCOPARIUS (L.) Link. In 1901 there were planted 1,000 bushes of this species. In 1913 there was to be seen but one small clump which still survived in Gourdeau Park. *H. St. John*, no. 1,261 (H).

TRIFOLIUM PRATENSE L. A weed, well established around the Life Saving Stations. *J. Dwight, Jr.* (D. p. 12) states that this species has "been cultivated near the stations." *H. T. Güssow; H. St. John*, no. 1,262 (H).

Fl.—August and September.

T. REPENS L. Dry sand flats and pond shores. An anonymous writer who visited Sable Island in 1851 says, "In the neighbourhood of the chief residence, where white clover and other grasses have been sown, so luxuriant is the yield that over 100 tons of hay are made annually" (Leisure Hour, xxx. 433, 1881).

J. Dwight, Jr., (D. p. 12) in referring to this species says, "Man's influence has been at work on the island for so many centuries that it is almost impossible to draw the line between indigenous species, if such there be, and those artificially introduced." This species grows particularly on the dry sands near the Life Saving Stations and along the shores of the adjacent ponds where the cattle and the domesticated ponies browse continually, and because of this it seemed to the writer that the White Clover was one of the species that was obviously introduced. Listed by *J. Macoun* (also as "white clover," M. p. 218A); *H. St. John*, no. 1,263 (H).

Fl., Fr.—August.

T. HYBRIDUM L. A garden weed. Listed by *J. Macoun; H. St. John*, no. 1,264 (H).

Fl., Fr.—September.

Lathyrus maritimus (L.) Bigel. Very abundant all over the island, and an able ally of the Sand Grass in its perpetual defensive

against the eroding forces that threaten to destroy the island. In 1633 *John Rose* reported, "store of wild peas" (Winthrop, John: History of New England from 1630 to 1649, ed. James Savage i. 162, 1825). Writing in 1753 *Andrew Le Mercier* (L) says of the island, "It hath abundance of Wild or Beach Pease, which fatten the cattle very well." In 1766 and 1767 *Joseph Frederick Wallet Des Barres* found "wild pease" (Atlantic Neptune i. 68, 1777). *Seth Coleman* in 1801 found the "wild Pea" (Rept. on Canadian Archives 91, 1895). *Joseph Howe*, in 1851, "was agreeably surprised to find it covered, for nearly its whole length of five and twenty miles, with natural grass and wild peas" (Append. to Journ. of House of Assembly of N. S. 161, 1851). The "wild pea" is mentioned by *J. B. Gilpin*, 1858 (G. p. 18). *J. C. Taché* mentions the abundance of the "Lentille du Canada, qu'on nomme ici 'pois sauvages'" (T. p. 29). *J. Dwight, Jr.* (D. p. 13) lists this with *Gnaphalium* sp. and calls them both weeds! Macoun says (M. p. 215A), "This one species of grass [*Ammophila arenaria*] with the wild pea (*Lathyrus maritimus*) constitutes the bulk of the wild hay cut for winter fodder and the winter pasturage of the wild horses." Listed by *J. Macoun* and *H. T. Güssow*. *H. St. John*, nos. 1,265 and 1, 266 (H).

Fl., Fr.—August.

[L. PALUSTRIS L. of *J. Macoun's* and *H. T. Güssow's* list is of the var. *macranthus*.]

L. palustris L., var. **macranthus** (T. G. White) Fernald. See Rhodora, xiii. 50 (1911). Abundant at the swampy or sandy borders of the fresh-water ponds. *J. Macoun* (C. nos. 21,165 and 21,195); *H. T. Güssow* (E); *H. St. John*, nos. 1,267 and 1,268 (H).

Fl., Fr.—August and September.

[L. PALUSTRIS L., var. MYRTIFOLIUS (Muhl.) Gray of *J. Macoun's* list is of the var. *macranthus*.]

L. palustris L., var. **retusus** Fernald & St. John, n. var., subpilosus, caule tenue paulo alato, stipulis lanceolatis semisagittatis 8–18 mm. longis, foliolis 2–3-jugis spatulatis vel cuneato-ellipticis mucronatis retusis 2–4.5 cm. longis, 0.6–1.6 cm. latis, cirrhis 2–4-fidis, 4-floris, 1.2–1.6 cm. longis, legumine 4 cm. longo.

Somewhat pilose throughout: the stem slender, slightly winged: stipules lanceolate, semisagittate, 8–18 mm. long: leaflets of 2 or 3 pairs, spatulate or cuneate-elliptic, mucronate, retuse, 2–4.5 cm. long, 0.6–1.6 cm. wide: tendrils well developed, 2–4-parted: flowers 4 in number, 1.2–1.6 cm. in length: the pod 4 cm. long.

Nova Scotia: edge of fresh-water pond, Sable Island, Aug. 21, 1913, *Harold St. John*, no. 1,271 (type in Gray Herb.).

This endemic variety differs from all the other known varieties of *Lathyrus palustris* in having the leaves broadest near the tip, and tapering gradually to a cuneate base.

Fl., Fr.—August.

EMPETRACEAE.

Empetrum nigrum L. Very abundant on the low undulating dunes and sheltered slopes in the more stable parts of the island. The juicy, attractively colored, but unpleasantly flavored berries form a part of the food of the birds that visit the island, especially the Curlews. They are sometimes used by the residents of the island in the manufacture of a slightly alcoholic drink. The berries are crushed, then after the addition of sugar or molasses the juice is put in a dark air-tight receptacle until the fermentation takes place. *J. Dwight, Jr.* (D. pp. 9 & 12) noticed that a large part of the island "is carpeted with the evergreen Crowberry (*Empetrum nigrum* L.)." *J. Macoun* also comments upon its abundance (M. p. 215A, 216A & 218A). It is listed by *H. T. Güssow*. *H. St. John*, nos. 1,269 and 1,270 (H).

Fr.—August and September.

AQUIFOLIACEAE.

Ilex verticillata (L.) Gray. Occasional on the dry slopes of shifting dunes. *H. St. John*, no. 2,041 (H).

Not observed in flower or fruit.

ACERACEAE.

Acer platanoides L. One sapling surviving at Life Saving Station, No. 3. In 1901 in the large planting there were 500 of these trees set out. *H. St. John*, no. 1,272 (H).

RHAMNACEAE.

Rhamnus Frangula L. A few ragged shrubs still surviving at Gourdeau Park. None of them exceed 2 feet in height. In 1901 there were 100 bushes of this set out. *H. St. John*, no. 1,273 (H).

MALVACEAE.

[*J. B. Gilpin* (G. p. 18–9) in 1858 devotes a single paragraph to the flora, beginning with, "A Botanist would give a scientific list of

thirty or forty varieties of shrubs and plants." He mentions ten species, closing with the phrase, "and as Autumn heats yellow the luxuriant green, the tall, mallow, gay golden rods and wild China-asters are swept by the heaving gales." *J. C. Taché* (T. p. 28–9) in 1885 refers to eight of these ten species in a passage which is nothing but a free translation from Gilpin. For instance Taché begins with, "La Flore des Sablons n'a point été complètement cataloguée: on a dit qu'un botaniste pourrait y observer trente à quarante espèces ou variétés; * * * * Ces deux plantes fourragères, auxquelles s'adjoignent la verge d'or, la mauve et des autres espèces * * * *" Taché, it will be seen has taken Gilpin's "tall, mallow," literally and records it definitely as, "la mauve." Gilpin's sentence, as it stands, is inconsistent, for if there were no comma after "tall," it would be clear that he wished to record some tall mallow. As it is, he seems to be setting off by commas a series of adjectives all qualifying "golden rods," and we may perhaps interpret "mallow" as a misprint for "mellow." No one of the four naturalists to visit Sable Island has found anything that could be called or mistaken for a "tall, mallow." Consequently, it seems better to drop this record as a probable error.]

GUTTIFERAE.

Hypericum boreale (Britton) Bicknell. Abundant in the wet dune hollows. *J. Macoun* (C. no. 21,158). Listed by *H. T. Güssow. H. St. John*, nos. 1,274 and 1,275 (H).

Fl., Fr.—August.

[H. MUTILUM L. of *J. Macoun's* list is *H. boreale*.]

H. virginicum L. Occasional in the wet dune hollows and cranberry bogs. *J. Macoun* (C. no. 21,157); listed by *H. T. Güssow; H. St. John*, no. 1,276 (H).

Fl.—July and August.

VIOLACEAE.

Viola septentrionalis Greene. Collected only by *H. S. Glazebrook*, the Station Master of Life Saving Station No. 3.

Fl.—June.

[V. OBLIQUA Hill (Blue Violets) is recorded by *J. Dwight, Jr.* (D. p. 13). A search in the Herbarium of the New York Botanical

Garden failed to reveal this specimen. It probably is to be regarded as *V. septentrionalis*.]

V. lanceolata L. Abundant in the wet dune hollows. [Recorded by *J. Dwight, Jr.* (D. p. 13), but the specimens on which this is based are *V. primulifolia*.] Listed by *H. T. Güssow*. *H. St. John*, no. 1,277 (H).

Fl.—June and July. *Fr.*—August.

V. primulifolia L. Rare, on dry sandy banks. Collected by *J. Dwight, Jr.; H. St. John*, no. 1,278 (H).

Fl.—June to August.

V. pallens (Banks) Brainerd. Common in the wet dune hollows, and along the swampy borders of the fresh-water ponds. *H. St. John*, nos. 1,279, 1,280, and 1,281 (H).

Fr.—August and September.

[V. BLANDA Willd. is listed by *H. T. Güssow*. The plant on which the record is based proves to be *V. incognita*, var. *Forbesii*.]

V. incognita Brainerd, var. **Forbesii** Brainerd. See Bull. Torr. Bot. Cl. xxxviii. 8 (1911). Found only by *H. T. Güssow* (E); and *H. S. Glazebrook* (H).

Fl.—June. *Fr.*—September.

ONAGRACEAE.

Epilobium molle Torr., var. **sabulonense** Fernald. Rhodora, xx. 31 (1918). Quoting from the original publication "habitu foliisque ut apud formam typicam; caulibus foliisque dense cinereo-pilosis, pilis adpressis incurvatis; capsulis cinereo-pilosis valde glandulosis.

"Habit and foliage as in the typical form: stems and leaves densely cinereous-pilose with appressed incurved hairs: capsules cinereous-pilose, copiously glandular."

NOVA SCOTIA: swampy edge of fresh-water pond at Life Saving Station No. 3, Sable Island, Sept. 9, 1913, *Harold St. John*, no. 1,282 (TYPE in Gray Herb.); rare, in a bog at No. 3 Station, Sable Island, (1899) *John Macoun* (C. no. 21,189).

Fl., Fr.—September.

"The only *Epilobium* known from Sable Island, 100 miles off the coast of Nova Scotia, is a plant collected in 1899 by Prof. John Macoun and in 1913 secured in quantity by Dr. Harold St. John; and from

the observations of both these explorers apparently the only member of the genus on the island. The plant in habit, outline of foliage, and large flowers, as well as in the characters of its calyx and seeds, exactly matches the common *E. molle* Torr. of the mainland, while the capsules have the peculiar glandular pubescence which is found upon the capsules of *E. molle*, but in the Sable Island plant much more highly developed than is common in mainland specimens. The stems and the leaves of the Sable Island plant, however, are densely cinereous with appressed and incurved hairs, exactly as in *E. densum* Raf.; *E. molle* having the stems, leaves, etc., densely covered with fine, straight conspicuously spreading pubescence.

"This Sable Island plant with the technical characters of calyx, petals, etc., and the glandular pubescence of the capsule, and the exact habit and leaf-outline of *E. molle*, but with the pubescence of the leaves and stems exactly as in *E. densum* would, if found upon the mainland, be promptly called a hybrid between those two species. But neither of the species has been detected on Sable Island, a region of sufficiently limited area to give assurance that the extended explorations of Macoun in 1899, of Güssow in 1911, and of St. John in 1913, when the latter explorer spent four weeks in an intensive study of the flora, would have brought to light any other existing member of the genus. Upon Sable Island, then, this plant, combining the characters of two ordinarily distinct species of the mainland, cannot be accepted as a hybrid, at least of modern origin. There is, moreover, reason to believe that the flora of Sable Island reached that area during the late Pleistocene and has been isolated from the mainland flora since that time. However long this period may have been, whether estimated by thousands or tens of thousands of years, it has certainly been a sufficient time for the Sable Island plant to have become thoroughly fixed in its characters, and even if, many thousands of years ago, it may have originated as a hybrid, it has upon Sable Island intensified its characters and become a thoroughly constant plant.

"The case of this plant is exactly comparable with that of *E. densum*, var. *nesophilum* * * * the peculiar variant of *E. densum* found upon Newfoundland and the Magdalen Islands, where no true *E. densum* is found, but in those areas suggesting that it might have originated in the long-distant past by the hybridization of *E. densum* of the South and *E. palustre* of the North. Whether these plants have had such an origin is entirely problematical and it may as confidently be argued

that they are local developments, which by insular isolation have become fixed entities, and are really the result of natural selection. Whatever the origin of these plants may be, they are now absolutely definite and consistent.''[1]

[E. MOLLE Torr., of *Macoun's* list is based on one of the plants cited above as *E. molle*, var. *sabulonense*.]

Oenothera cruciata Nutt. Occasional on the slopes of the dry dunes. *J. Macoun* (C. no. 21,193 in part); *H. St. John*, no. 1,283 (H).

Fl.—July and August. *Fr.*—August and September.

[O. OAKESIANA Robbins. The material so reported by *J. Macoun*, (C. no. 21,193) is in part *O. cruciata*, in part *O. muricata*.]

O. muricata L. Common on the slopes of the dry dunes. Collected by *J. Macoun* (C. nos. 78,527, and 21,193 in part); *H. St. John*, nos. 1,284 and 1,285 (H).

Fl., Fr.—August.

HALORAGIDACEAE.

Myriophyllum tenellum Bigel. Very abundant and forming solid bands submersed or emersed at the borders of the fresh-water ponds. *Dr. A. H. MacKay* in Trans. N. S. Inst. Sci. x. 320 (1900) mentions specimens found by *J. Macoun*. Listed by *J. Macoun*, and *H. T. Güssow*. *H. St. John*, nos. 1,287, and 1,288 (H).

Fl.—July and August. *Fr.*—September.

Hippuris vulgaris L. In the swampy margins of a few of the larger and more permanent fresh-water ponds. Listed by *J. Macoun;* and *H. T. Güssow*. *H. St. John*, no. 1,289 (H).

Fl., Fr.—August.

UMBELLIFERAE.

Ligusticum scothicum L. One single clump observed near the brackish margin of Wallace Lake. *H. St. John*, no. 1,290 (H).

Fl., Fr.—August.

Coelopleurum lucidum (L.) Fernald. (*C. actaeifolium* (Michx.) C. & R.) Infrequent on the slopes of the turf-covered dunes. Listed by *J. Macoun;* and *H. T. Güssow*. *H. St. John*, nos. 1,291, 1,292, and 1,293 (H).

Fl., Fr.—September.

[1] Fernald, *l. c.* 30–31.

PASTINACA SATIVA L. Planted in the garden of the East End Lighthouse. *H. St. John*, no. 1,294 (H).

Fr.—September.

DAUCUS CAROTA L. A weed in the garden at Life Saving Station No. 4. *H. St. John*, no. 1,295 (H).

Fl.—September.

CORNACEAE.

Cornus canadensis L. This species has been observed and collected only by *J. Dwight, Jr.* (D. pp. 13 and 42).

ERICACEAE.

CALLUNA VULGARIS (L.) Hull. Adventive but not well established, growing on the sheltered turf-covered slopes of the dunes. When *J. Macoun* visited Sable Island in 1899, he did not find *Calluna*. *H. T. Güssow* in 1911 collected it and noted, "found about ½ mile west of Marconi Station, 3 solitary clumps and 1 solitary clump 10 miles East, close to No. 3 Station." In 1913, during my visit, only two clumps were observed, both being in Gourdeau Park, the locality near the Marconi Station mentioned by Güssow. It will be noticed that the first records of *Calluna* on the island come after the year 1901, when the large forestry planting was done. The trees were in greater part imported from a French nursery and Mr. R. J. Bouteillier, at that time Superintendent of the island, tells me that although *Calluna* was not included in the list of imported plants, it sprang up soon after near them, and was in all probability used for, or carried in, the protective packing around the trees. Collected by *H. T. Güssow* (E); and *H. St. John*, no. 1,296 (H).

Fl.—August and September.

Vaccinium pennsylvanicum Lam. Very abundant on the low turf-covered dunes and undulating barrens. In 1766 and 1767, *J. F. W. Des Barres* observed "blueberries—&c., in their season" (Atlantic Neptune, i. 68, 1777). *J. B. Gilpin* writing in 1858 remarks that "blueberries * * * are in abundance" (G. p. 18). *J. C. Taché* mentions, "On y trouve, en fait des fruits, * * * les bluets" (T. p. 29). *J. Dwight* in 1895 reports this species in blossom the second week of June (D. pp. 13 and 42). Listed by *J. Macoun* (also M. p. 218A); and *H. T. Güssow*. *H. St. John*, no. 1,297 (H).

Fl.—June. *Fr.*—September.

V. macrocarpon Ait. Very abundant in most of the wet dune hollows. The cranberries form the only crop produced on the island that is of any importance. From 50 to 200 barrels are picked and exported every year. *J. F. W. Des Barres* reported that in 1766 and 1767 he found, "hollows and ponds of fresh-water, the skirts of which abound with cranberries the whole year" (Atlantic Neptune, i. 68, 1777). *Joseph Howe* in 1851 found that "Cranberries of Large size, and fine flavour, grow in abundance on Sable Island. A few barrels of these are generally picked in the autumn, but the cranberry, as a source of income, or a means of employment, has scarcely ever been thought of by our people" (Append. to Journ. of House of Assembly, Prov. of N. S. 161, 1851). *J. B. Gilpin* recorded in 1858 that "cranberries are in abundance (G. p. 18). *J. C. Taché* mentions that, "on y trouve, en fait des fruits, * * * les atocas." "Les atocas y abondent et constituent un objet d'exportation, dont la valeur annuelle s'élève à quelques centaines de piastres," (T. p. 29). *J. Dwight, Jr.* (D. p. 13) speaks of the abundance of "Cranberries (*Schollera macrocarpa* (Ait.))." They are also included in the lists of *J. Macoun* (also M. p. 215A & 216A); and *H. T. Güssow*. *H. St. John*, no 1,298 (H).

Fr.—August and September.

[V. Oxycoccus L. The only record for this species is by Capt. Fawson in his report, October 15, 1801 (see Murdoch, Beamish: Hist. of Nova-Scotia ii. 6, 1866), where he refers to it by the common name, "bogberries." He mentions both "bogberries" and "cranberries," so he is apparently intending to distinguish between the two, but as there are no other records of the former from the island and no specimens, this record needs confirmation.]

PRIMULACEAE.

Lysimachia terrestris (L.) B. S. P. Occasional in the wet dune hollows. Listed by *J. Macoun;* and *H. T. Güssow*. *H. St. John*, nos. 1,299, and 1,300 (H).

Fl.—August.

Trientalis borealis Raf. (*T. americana* (Pers). Pursh). Common on the turf-covered dunes and barrens. Listed by *J. Macoun*. *H. St. John*, nos. 1,301 and 1,302 (H); *H. S. Glazebrook* (H).

Fl.—June.

Centunculus minimus L. Locally found on bare sand flats which are occasionally flooded by the sea. *J. Macoun* (C. no. 22,544); *H. St. John*, no. 1,303 (H).

Fl., Fr.—August.

GENTIANACEAE.

[SABBATIA CHLOROIDES Pursh. "The chief annual is of southern extraction." The material on which this record of *J. Macoun's* (M. p. 218A) is based is *Centaurium umbellatum*.]

Bartonia iodandra Robinson, var. **sabulonensis** Fernald, n. var., a forma typica recedit floribus numerosis (4–30), ramibus saepe dichotomis, pedunculis valde clavatis, calyce valde fisso lobis plerumque distinctis.

Differing from the typical form in its more numerous (4–30) flowers; the branches often dichotomous; peduncles more clavate; calyx deeply cleft, the lobes mostly distinct.

NOVA SCOTIA: swampy edges of fresh ponds, Sable Island, August 30 and September 12, 1913, *H. St. John*, nos. 1,306, 1,307 (TYPE in Gray Herb.).

Fl.—August and September. *Fr.*—September.

In typical *Bartonia iodandra* of Newfoundland and Cape Breton the 1–7-flowered plants have simple branches and the peduncles are more filiform. The calyx in all the Newfoundland and Cape Breton material (examined from eight regions) is cleft only $\frac{2}{3}$ to $\frac{3}{4}$ to the base, the tube being 1–2 mm. long and nerveless. The Sable Island plant with usually more numerous flowers on often forking branches rarely has a definite calyx-tube, most of the material showing the calyx with lobes distinct essentially to the base, the margins of the outer lobes decurrent down the peduncle. In this character the Sable Island plant approaches the more southern *B. virginica* (L.) B S P. and *B. paniculata* (Michx.) Robinson, in both of which the calyx-lobes are essentially distinct. In those more southern yellowish-stemmed plants, however, the yellowish-green calyx-lobes and the usually yellowish leaves are firm and subulate and the yellow corolla is at most 5 mm. long. The Sable Island plant has the leaves scattered or alternate as in *B. paniculata* but, like those of *B. iodandra*, they are ovate to oblong-lanceolate, bluntish and purple. The stem likewise is purple, the calyx-lobes flat and thin, ovate to oblong-lanceolate, and the mature petaloid whitish corolla 5–6 mm. long, all characters of *B. iodandra*. The anthers of *B. iodandra* are generally

purple though sometimes becoming yellowish; those of var. *sabulonensis* at first purple, but in maturity, becoming yellow like those of the more southern species. On Newfoundland and Cape Breton *B. iodandra* is in flower through August, but the Sable Island plant is some weeks later, the material collected August 30, being only in bud.

Combining the color, foliage, and most of the flower-characters of *B. iodandra* with the habit and more deeply cleft calyx of *B. paniculata*, the Sable Island plant presents an interesting transition. *B. paniculata* is characteristic of the Coastal Plain from Louisiana to southeastern Massachusetts, rarely extending to southernmost Maine. *B. iodandra* in typical development is confined to Cape Breton and Newfoundland; and the transitional plant to the isolated Sable Island, one of the last remnants of the ancient continental shelf which extended from southern New England to the Newfoundland banks. It would thus seem probable that the widely distributed southern *B. paniculata* originally spread northward on the continental shelf, becoming modified toward the North, the Sable Island plant still retaining some distinctive *paniculata*-characters, which have disappeared from the more northern and further isolated *B. iodandra* of Cape Breton and Newfoundland.

Menyanthes trifoliata L. "Quite rare, in ponds at No. 3 station." Found only by *J. Macoun* (C. no. 22,541).

Centaurium umbellatum Gilib. Very common in the wet dune hollows, and by the wet sandy borders of the fresh-water ponds. Not near the Life Saving Stations or the Lighthouses and not giving any indication of being introduced. This species has been known in North America for a long time, but it has universally been treated in botanical manuals as an introduced plant. This seems to be the true explanation in the greater number of the cases, such as the record from Concord, Massachusetts,[1] A.W. Hosmer reporting it "found at Concord in 1890, not seen since." The species is occasional in the State of Michigan, but there it also seems to be an introduction.

There is, however, a station near Oswego, New York, which has been known for nearly a hundred years. In 1833 Beck reported,[2]

[1]As *Erythraea Centaurium* Pers., Rhodora i. 224 (1899).

[2]As *Erythraea Centaurium* Pers., Beck, L. C.: Bot. of N. and Middle States, 242 (1833).

"I have specimens of this plant which were found near Oswego, N. Y., by the Rev. David Brown of Lockport. It is apparently indigenous." In 1865, J. A. Paine commented,[1] "Meadows and pastures, Oswego, two miles northward near the Lake shore; two or three miles south of the city and east of the river, borders of woods. Local." The evidence presented by the collectors and the field observers would certainly tend to indicate that in this case, at least, the plant was a native. In this connection the form of the successive records of the species from Sable Island is illuminating. The plant seems first to have been recorded from Sable Island (under the name E[RYTHRAEA] CENTAURIUM Pers.) in Macoun's Catalogue, ii. 342 (1890): "Sandy wastes on Sable Island off the coast of Nova Scotia. Collected July, 1870. (Mrs. Almond)." This record now appears in Gray's Manual[2] as "Waste grounds, N. S.;" in Britton and Brown's Illustrated Flora,[3] "In waste places, Nova Scotia—Naturalized from Europe." Now "sandy wastes" on Sable Island are not "waste places;" they are in the strictest sense the sand dunes, and not a habitat in which the plants could be assumed to be introduced.

Collected by *J. Macoun* (C. no. 22,543); and by *H. T. Güssow* (E); *H. St. John*, nos. 1,304, and 1,305 (H).

Fl.—August and September. *Fr.*—September.

CONVOLVULACEAE.

Convolvulus sepium L. Abundant on the slopes of the dry dunes, where the stems intertwine for great distances between the culms of *Ammophila* and *Lathyrus maritimus*, helping in the formation of the dense tangles in the more sheltered places. Listed by *J. Macoun*. *H. St. John*, nos. 1,359 and 1,360 (H).

Fl., Fr.—September.

BORAGINACEAE.

LAPPULA ECHINATA Gilib. A single adventive specimen found near the Main Life Saving Station. *H. St. John*, no. 1,308 (H).

Fl.—August.

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[1]As *Erythraea Centaurium* Pers. Paine, J. A.: Cat. of Pl. Found in Oneida Co., and Vicinity, 64 (116) (1865).

[2]Robinson, B. L., and Fernald, M. L.: Gray's Manual, ed. 7, 656 (1908).

[3]As *Centaurium Centaurium* (L.) W. F. Wight, Britton and Brown: Ill. Fl., ed. 2, iii. 2 (1913).

LABIATAE.

Teucrium canadense L., var. **littorale** (Bicknell) Fernald. Observed only on the turfy shores of the fresh-water ponds near the eastern end of Wallace Lake. *H. St. John*, no. 1,309 (H).

Fl.—September.

Galeopsis Tetrahit L., var. bifida (Boenn.) Lejeune & Courtois. A weed at the Main Life Saving Station. *H. St. John*, no. 1,310 (H).

Fl., Fr.—September.

[Lycopus uniflorus Michx. Listed by *J. Macoun* and *H. T. Güssow*. These collections are undoubtedly of the following variety.]

Lycopus uniflorus Michx., var. **ovatus** Fernald & St. John, n. var., foliis sessilibus vel brevi-petiolatis ovato-lanceolatis vel deltoideo-ovatis grosse serratis, dentibus 4–6 acris prorsum vergentibus.

Leaves sessile or short petioled, ovate-lanceolate or deltoid-ovate, coarsely serrate with 4–6 sharp teeth which point directly forward.

Nova Scotia: wet dune hollow, Sable Island, August 15, 1913, *H. St. John*, no. 1,311 (type in Gray Herb.); Canso, August 17, 1900, *J. Fowler*, in part (H). Oregon: Sullivan's Gulch, Portland, July 14, 1902, *E. P. Sheldon*, no. 10,888 (H).

Mentha arvensis L. Observed only on turfy knolls by the shore of the fresh-water ponds at the eastern end of Wallace Lake. *H. St. John*, nos. 1,312 and 1,313 (H).

Fl.—September.

[M. canadensis L. of *J. Macoun's* list is probably the preceding, *M. arvensis*.]

SOLANACEAE.

Solanum nigrum L. A weed thoroughly established in the gardens of the Main Life Saving Station. Listed by *J. Macoun*. *H. T. Güssow* (E); *H. St. John*, no. 1,314 (H).

Fl.—August and September. *Fr.*—September.

Lycium europaeum L. A few bushes planted and surviving in the garden at Life Saving Station No. 3. *H. St. John*, no. 1,315 (H).

SCROPHULARIACEAE.

Limosella subulata Ives. See Fernald, Rhodora, xx. 164 (1918). Abundant on the brackish beach of, and sand flats near Wallace Lake. Listed by *J. Macoun*. *H. St. John*, no. 1,316 (H).

Fl., Fr.—August.

Agalinis paupercula (Gray) Britton, var. **neoscotica** Pennell & St. John, n. comb., *Gerardia neoscotica* Greene, Leaflets of Bot. Observ. and Crit. ii. 106–7 (1910). Greene's type, collected by himself at Middleton, Nova Scotia, has been examined by Dr. Pennell and myself and we feel that it and the Sable Island plant belong in the same category. The var. *neoscotica* differs from *A. paupercula* in being only 1–2.5 dm. in height, in having the leaves broader, being broadly linear, 1–3 cm. long and 1.5–4.5 mm. wide; the lobes of the calyx are unusually long, 3–8 mm. and of unequal length; the corolla lobes are scarcely at all spreading; the anther sacs are glabrous.

Common in the wet dune hollows. *J. Macoun* (C. no. 22,576); *H. St. John*, nos. 1,317 and 1,318 (H).

Fl., Fr.—August.

[GERARDIA PAUPERCULA (Gray) Britton of *J. Macoun's* list is *Agalinis paupercula*, var. *neoscotica*.]

Euphrasia purpurea Reeks, var. **Randii** (Robinson) Fernald & Wiegand. Common in the boggy dune hollows. *H. St. John*, no. 1,319 (H).

Fl., Fr.—August.

Euphrasia americana Wettst. Listed by *H. T. Güssow.*

Rhinanthus Crista-galli L. Common on the drier, turf-covered dunes. Collected by *J. Macoun* (C. no. 22,577); *H. T. Güssow* (E); *H. St. John*, no. 1,320 (H).

Fl.—July. *Fr.*—July and August.

[R. OBLONGIFOLIUS Fernald of *J. Macoun's* list is *R. Crista-galli* L.]

LENTIBULARIACEAE.

Utricularia cornuta Michx. Found only by *J. Macoun* (C. no. 22,574).

Fl.—July.

PLANTAGINACEAE.

PLANTAGO MAJOR L. Listed by *H. T. Güssow.*

P. major L., var. **intermedia** (Gilib.) Dcne. Brackish beaches of Wallace Lake. Listed by *J. Macoun*. *H. St. John*, no. 1,321 (H).

Fl., Fr.—August.

P. decipiens Barneoud. Common on the brackish beaches of Wallace Lake and the brackish ponds. Listed by *J. Macoun;* and *H. T. Güssow. H. St. John*, no. 1,322 (H).

Fl., Fr.—August.

RUBIACEAE.

Galium trifidum L. Very common in the wet dune hollows and along the swampy borders of the fresh-water ponds. *J. Macoun* (C. no. 81,150); *H. T. Güssow* (E); *H. St. John*, no. 1,324 (H).

Fl., Fr.—August and September.

[G. TINCTORIUM L., of *J. Macoun* and *H. T. Güssow* is *G. trifidum.*]

G. Claytoni Michx. In the wet dune hollows. *H. St. John*, no. 1,323 (H).

Fl., Fr.—August.

Mitchella repens L. Uncommon and local, on turf-covered dunes. *J. Dwight, Jr.*, records this (D. p. 13). Listed by *J. Macoun;* and *H. T. Güssow. H. St. John*, no. 1,325 (H).

Fr.—August.

CAPRIFOLIACEAE.

Lonicera caerulea L., var. **calvescens** Fernald & Wiegand, Rhodora, xii. 210 (1910). On the turf-covered dunes. Collected by *J. Dwight, Jr.;* and *J. Macoun* (C. no. 22,491).

Not observed in flower or fruit.

Linnaea borealis L., var. **americana** (Forbes) Rehder. Creeping between the stems of the prostrate Junipers and *Empetrum* where they form a thick turf on the low dunes. Listed by *J. Macoun;* and *H. T. Güssow. H. St. John*, no. 1,326 (H).

Not observed in flower or fruit.

Viburnum cassinoides L. Occasional on the turf-covered dunes. *J. B. Gilpin* wrote in 1858 (G. p. 18), "The usual shrubs are dwarft to a few inches; * * * [the] low with-wood would not afford a riding cane." Listed by *J. Macoun;* and *H. T. Güssow. H. St. John*, nos. 1,327 and 1,328 (H).

Not observed in flower or fruit.

CAMPANULACEAE.

Lobelia Dortmanna L. Abundant along the wet margins of the fresh-water ponds. Listed by *J. Macoun*. *H. St. John*, no. 1,329 (H).

Fl., Fr.—August.

COMPOSITAE.

Solidago sempervirens L. Common in all of the drier parts of the island, especially so along the North, and the South Ridge, which are ranges of dunes close to and parallel with the sea beaches. *J. B. Gilpin* in 1858 (G. p. 19) remarked upon the "gay golden rods." *J. C. Taché* mentions "la verge d'or" (T. p. 29). Collected by *J. Macoun* (C. no. 22,535); and *H. T. Güssow* (E); *H. St. John*, nos. 1,330–1,334 (H).

Fl.—September.

Aster novi-belgii L. Very abundant on the dry dunes, or even at the swampy borders of the fresh-water ponds. *J. B. Gilpin* (G. pp. 18–9) in 1858 noted, "As autumn heats yellow the luxuriant green, the tall, mallow, gay golden rods and wild China-asters are swept by the heaving gales." Collected by *J. Macoun* (C. no. 22,502); *H. T. Güssow* (E); *H. St. John*, nos. 1,335–1,339 (H).

Fl.—Middle of August to September.

A. novi-belgii L., var. **litoreus** Gray. Occasional at the edge of the brackish ponds. *J. Macoun* (C. no. 22,502); *H. St. John*, no. 1,340 (H).

[ANAPHALIS MARGARITACEA (L.) B. & H. of *J. Macoun* and presumably of *H. T. Güssow* is the following var. *subalpina*.]

Anaphalis margaritacea (L.) B. & H., var. **subalpina** Gray. Very common on the dry dunes and barrens. *J. Macoun* (C. no. 22,515); *H. St. John*, no. 1,341 (H).

Fl.—August.

Gnaphalium obtusifolium L. (*G. polycephalum* Michx.) Abundant on the dry dunes and barrens. *J. Dwight's* mention (D. p. 13) of "*Gnaphalium* sp?" which he dubs a weed should probably be referred here. Listed by *J. Macoun*. *H. T. Güssow* (E); *H. St. John*, nos. 1,342 and 1,343 (H).

Fl., Fr.—August and September.

G. ULIGINOSUM L. A weed well established at the Main Life Saving Station. Listed by *J. Macoun*. *H. St. John*, no. 1,344 (H).

Fl., Fr.—August.

RUDBECKIA HIRTA L. A weed collected by *J. Macoun* (C. no. 23,439) in 1899 but not observed by the subsequent botanical collectors.

Fl.—August.

Bidens frondosa L. Listed by *J. Macoun*.

B. connata Muhl., var. **petiolata** (Nutt.) Farwell. See Fernald, Rhodora, x. 200 (1908). Infrequent, at the borders of fresh-water ponds. *H. T. Güssow* (E); *H. St. John*, no. 1,345 (H).

Fl., Fr.—September.

[B. CERNUA L. of *H. T. Güssow* is *B. connata*, var. *petiolata*.]

[ACHILLEA MILLEFOLIUM L. is listed by *J. Macoun*; and *H. T. Güssow*. The material is probably identical with that collected by the author and cited under the following, *A. lanulosa*.]

Achillea lanulosa Nutt. Very abundant on the dry dunes and barrens. *H. St. John*, no. 1,346 (H).

Fl.—August.

ANTHEMIS COTULA L. Thoroughly established at the Main Life Saving Station. Listed by *J. Macoun; H. T. Güssow. H. St. John*, no. 1,347 (H).

Fl., Fr.—August.

CHRYSANTHEMUM LEUCANTHEMUM L., var. PINNATIFIDUM Lecoq & Lamotte. A weed at the Main Life Saving Station. *H. St. John*, no. 1,348 (H).

Fl.—August.

Senecio Pseudo-Arnica Less. Infrequent in the gulches near the sea and at the top of the beaches. Listed by *J. Macoun;* and *H. T. Güssow. H. St. John*, no. 1,349 (H).

Fl., Fr.—August.

CIRSIUM ARVENSE (L.) Scop. A weed thoroughly established near the Life Saving Stations and spreading. Listed by *J. Macoun. H. T. Güssow* (E); *H. St. John*, no. 1,350 (H).

Fl., Fr.—August and September.

CICHORIUM INTYBUS L. A weed at the Main Life Saving Station. Only one plant seen. *H. St. John*, no. 1,351 (H).

Fr.—September.

LEONTODON AUTUMNALIS L. Thoroughly established near the Life Saving Stations. Listed by *J. Macoun* (also mentioned, "fall dandelion" M. p. 218A); and *H. T. Güssow*. *H. St. John*, no. 1,352 (H).

Fl., Fr.—August.

TARAXACUM OFFICINALE Weber. A weed in the garden at the Main Life Saving Station. Listed by *J. Macoun*. *H. St. John*, no. 1,353 (H).

Fl., Fr.—August.

SONCHUS ASPER (L.) Hill. A weed at the Main Life Saving Station. *H. St. John*, no. 1,354 (H).

Fl., Fr.—August.

Prenanthes trifoliolata (Cass.) Fernald. Occasional on all the drier parts of the island. Collected by *J. Macoun* (C. no. 22,522); *H. T. Güssow* (E); and *H. St. John*, no. 1,355 (H).

Fl., Fr.—August and September.

P. nana (Bigel.) Torr. Infrequent on the turf-covered dunes. *H. St. John*, no. 1,356 (H).

Fl.—August.

Hieracium scabrum Michx., var. **leucocaule** Fernald & St. John. Rhodora, xvi. 182 (1914). To the present date this variety is still an endemic of Sable Island. It occurs scattered over the barrens between Life Saving Station No. 3 and the East End Lighthouse. Collected by *J. Macoun* (C. no. 22,525); *H. T. Güssow* (E); *H. St. John*, nos. 1,357 and 1,358 (H).

Fl., Fr.—September.

[H. CANADENSE Michx. of *J. Macoun's* list is *H. scabrum*, var. *leucocaule*.]

List of Abbreviations.

(C) = Herbarium of the Canadian Geological Survey.

(D) = Dwight, Jonathan, Jr.: The Ipswich Sparrow. Mem. Nuttall Ornith. Club, ii. 1–56 (1895).

(E) = Herbarium of the Central Experimental Farm, Ottawa, Canada.

(G) = Gilpin, John Bernard: Sable Island. 1–24 (1858).

(H) = Gray Herbarium of Harvard University.

(L) = Le Mercier, Andrew: The Island Sables. Boston Weekly News Letter. February 8 (1753).

(M) = Macoun, John: Sable Island. Ann. Rep. Can. Geol. Surv. n. s. xii. 212A–219A (1899).

(P) = Herbarium of the Academy of Natural Sciences of Philadelphia, Pennsylvania.

(T) = Taché, Jean Charles: Les Sablons, 1–154 (1885).

New Species, Varieties, and Forms.

Juniperus communis L., var. **megistocarpa** Fernald & St. John
Juncus pelocarpus Mey., var. **sabulonensis** St. John
Calopogon pul.hellus (Sw.) R. Br. f., **latifolius** St. John
Polygonum hydropiperoides Michx., var. **psilostachyum** St. John
Rubus **arcuans** Fernald & St. John
Lathyrus palustris L., var. **retusus** Fernald & St. John
Bartonia iodandra Robinson, var. **sabulonensis** Fernald
Lycopus uniflorus Michx., var. **ovatus** Fernald & St. John
Agalinis paupercula (Gray) Britton, var. **neoscotica** (Greene) Pennell & St. John.

TABULAR STATEMENT OF FAMILIES, GENERA, SPECIES, VARIETIES, AND FORMS OF THE NATIVE OR ADVENTIVE FLORA.

Families.	Genera.	Native Species.	Adventive Species.	Native Varieties.	Adventive Varieties.	Native Forms.
Polypodiaceae	1	1				
Osmundaceae	1	1				
Lycopodiaceae	1	1				
Pinaceae	1	1		1		
Typhaceae	1	1				
Sparganiaceae	1	1				
Potamogetonaceae	3	5		2		
Gramineae	17	8	9	5	2	
Cyperaceae	3	8		5		
Eriocaulaceae	1	1				
Juncaceae	2	3		5		
Liliaceae	1	1				
Iridaceae	2	2				
Orchidaceae	3	4		1		1
Myricaceae	1	1				
Polygonaceae	2	2	7	2	2	
Chenopodiaceae	2	1	1	1		
Caryophyllaceae	7	2	5	2		
Portulacaceae	1		1			
Nymphaeaceae	1	1				
Ranunculaceae	3	3	2	1		
Cruciferae	5	1	4			
Droseraceae	1	2				
Crassulaceae	1	1				
Rosaceae	7	6		4		
Leguminosae	2	1	3	2		
Empetraceae	1	1				
Aquifoliaceae	1	1				
Guttiferae	1	2				
Violaceae	1	4		1		

Families.	Genera.	Native Species.	Adventive Species.	Native Varieties.	Adventive Varieties.	Native Forms.
Onagraceae	2	2		1		
Haloragidaceae	2	2				
Umbelliferae	3	2	1			
Cornaceae	1	1				
Ericaceae	2	2	1			
Primulaceae	3	3				
Gentianaceae	3	2		1		
Convolvulaceae	1	1				
Boraginaceae	1		1			
Labiatae	4	1		2	1	
Solanaceae	1		1			
Scrophulariaceae	4	3		2		
Lentibulariaceae	1	1				
Plantaginaceae	1	1	1	1		
Rubiaceae	2	3				
Caprifoliaceae	3	1		2		
Campanulaceae	1	1				
Compositae	17	8	8	4	1	
Totals	127	101	45	45	6	1
Total of native and adventive species, varieties and forms	198					
Planted species not included in preceding table	15					
Total flora	213					

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EXPLANATION OF PLATES.

PLATE 1.

1. *Juncus pelocarpus* E. Mey., var. *sabulonensis* St. John, n. var. Habit sketch from the type, × 2.
1a. Detail of fruit of the type, × 5.
1b. Seed of the type, × 10.
2. *Juncus pelocarpus* E. Mey. Detail of fruit after Buchenau, F.: Juncaceae. Pflanzenreich, iv. fam. 36, f. 84 E (1906).
3. *Polygonum hydropiperoides* Michx., var. *psilostachyum* St. John. Habit sketch from the type, × ½.
3a. Detail of inflorescence showing the eciliate ocreolae, from the type, × 2.
4. *Calopogon pulchellus* (Sw.) R. Br., forma *latifolius* St. John. Habit sketch of the type, × ½.
5. *Polygonum lapathifolium* L., var. *prostratum* Wimmer. Habit sketch showing the tip half of one of the prostrate branches, from *St. John*, no. 1,361, Sable Island, Nova Scotia, September 4, 1913, × ½.
5a. Detail of a spike, × 2.
5b. A single fruit showing the raised anchor-like nerves on the two outer sepals, from the above, × 5.
5c. A mature achene, from the above, × 5.
6. *Lathyrus palustris* L., var. *retusus* Fernald & St. John. Habit view of several median leaves of the type, × ½.

1a
1b
2
1
4
3a
3
5
6
5c
5b
5a
'917

PLATE 2.

7. *Rubus arcuans* Fernald & St. John. Habit sketch of fruiting branchlet of the type, × ½.

7a. Flowering spray drawn from the specimen *St. John*, no. 1,259 from Sable Island, Nova Scotia, × ½.

7b. Detail of the base of a fruiting pedicel of the type, × 4.

7c. Sketch of a segment of a first-year cane and a single leaf from the type, × ½.

7d. Enlarged view of a portion of a first-year cane of the type, × 2.

8. *Epilobium molle* Torr., var. *sabulonense* Fernald. Detail of a portion of the stem and the base of a leaf showing the appressed pubescence, from the type, × 4.

9. *Lycopus uniflorus* Michx., var. *ovatus* Fernald & St. John. Habit sketch of the type, × ½.

10. *Bartonia iodandra* Robinson, var. *sabulonensis* Fernald. Habit sketch of the upper half of a plant, from the type, × 1.

10a. Enlarged view of a single flower, from the type, × 2.

11. *Bartonia iodandra* Robinson. Enlarged view of a single flower, drawn from *M. L. Fernald & K. M. Wiegand*, no. 3,913, Birchy Cove, Newfoundland, Aug. 11, 1910, × 2.

12. *Agalinis paupercula* (Gray) Britton, var. *neoscotica* (Greene) Pennell & St. John. Habit view drawn from *St. John*, no. 1,318, Sable Island, Nova Scotia, Aug. 18, 1913, × ½.

12a. Corolla seen from within, drawn from *St. John*, no. 1,318, × 1.

12b. Enlarged view of an anther and part of its filament, showing the glabrous line of dehiscence of the anther sacs and the attachment of the hairs to the nearer side of the filament, drawn from *St. John*, no. 1,318, × 10.

13. *Hieracium scabrum* Michx., var. *leucocaule* Fernald & St. John. Habit sketch of a plant on the type sheet, × ½.

14. *Hieracium scabrum* Michx. Base of plant showing characteristic villous pubescence of the petioles and the base of the stem, drawn from the specimen, *Ezra Brainerd*, Cobble Hill, New Haven, Vermont, Aug. 18, 1898, × ½.

7b
7d
7a
7c
7
12a
12
13
10
12b
8
9
10a
11
14

[Reprinted from RHODORA, Vol. 23, Nos. 269–276, May–December, 1921.]

CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY

NEW SERIES, NO. LXIII.

THE GRAY HERBARIUM EXPEDITION TO NOVA SCOTIA, 1920.

M. L. FERNALD

DATES OF ISSUE.

Pages 89–111 and Plate 130,	19 May, 1921.
" 130–152,	26 August, 1921.
" 153–171,	24 October, 1921.
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THE GRAY HERBARIUM EXPEDITION TO NOVA SCOTIA, 1920

M. L. Fernald

(Plate 130)

Part I. Journal of the Expedition.

At first thought Nova Scotia would hardly occur to the student of our vascular floras as a particularly inviting field for a summer's expedition. The province is one of the longest-settled and most visited regions of North America; the area best known to tourists, "the Valley" (the valleys of the Cornwallis and Annapolis Rivers), being closely cultivated and widely exploited as the "Evangeline Land," the home of Nova Scotian farms and orchards. The wildest region of the province, the northern half of Cape Breton Island, geologically, physiographically and floristically very different from Nova Scotia proper, has already attracted several discriminating collectors and has been carefully treated, from the ecological viewpoint at least, by Nichols,[2] whose work on the region has been called "by far the most important ecological study yet made on the vegetation of northeastern America."[3] The veteran Government Naturalist, the late Professor John Macoun, repeatedly collected in all parts of the province; and the local botanists who, in Nova Scotia

[1] Read before the New England Botanical Club, February 4, 1921.

[2] Nichols, The Vegetation of Northern Cape Breton Island, Nova Scotia. Trans. Conn. Acad. Arts and Sci. xxii. pp. 249–467 (1918).

[3] Ganong, Rhodora, xxi. 171 (1919).

as almost everywhere else, were more active in the field a generation or two ago than at the present period of narrow specialization or indifference to the tremendous problems of natural history, have published numerous local lists and records, including the *Catalogue of the Flora of Nova Scotia* by Lindsay.[1] Professor Sommers's *Introduction* to the latter work gives a pretty strong intimation that there is little left to be learned regarding the vascular element of the Nova Scotian flora, an impression surely conveyed by the following words: "it may be accepted as the most complete synopsis of the Nova Scotian Flora yet offered . . . . while the P[h]enerogamia exclusive of Cyperaceae and Gramin[e]ae are nearly complete, the Cryptogamia, excepting Filices and Lycopodiac[ea]e, are but sparingly represented." Furthermore, one of the most acute Nova Scotian botanists of recent years, the late Dr. Charles Budd Robinson, has stated that, "In general, the flora of the peninsula and island is composed of plants which have migrated from the west or southwest through New Brunswick;"[2] the other elements of the Nova Scotian flora recognized by Robinson being the introduced weeds and, in northern Cape Breton, "a third element, namely, species that are believed not to occur anywhere upon the peninsular portion of the province," in illustration of which 8 species are mentioned, some of which, like *Habenaria blephariglottis*, *Aster nemoralis* and *Drosera intermedia*, are not only found on the peninsula but are there dominant plants over hundreds of square miles of acid bog. In fact, Professor L. W. Bailey, in his report on the geology of Yarmouth and Digby Counties had specially commented on "the abundance of orchids, . . . The most common species . . . . . is the white-fringed orchis (*Habenaria blephariglotis*, Hook)."[3] It would thus seem, that the students of our northeastern flora, desirous of spending the summer in the field to the best advantage and restrained by the present state of transportation-facilities and of manpower from the exploration of less accessible regions of Gaspé, Newfoundland or Labrador, would be almost wasting time by concentrating on Nova Scotia.

Nevertheless, outside the very general collections of Professor Macoun there exist, in this country at least, comparatively few

[1] A. W. H. Lindsay, Proc. and Trans. N. S. Inst. Nat. Sci. iv. pt. 2, 184–222 (1877).
[2] C. B. Robinson as reported in Torreya, vi. 257 (1906).
[3] L. W. Bailey, Geol. Surv. Can. Ann. Rep. n. s. ix. 18M (1898).

specimens to represent Nova Scotia; and when a prominent present-day Nova Scotian botanist, asked about some critical species he is supposed to have discovered, replies that his only available evidence is a marginal memorandum in the *Manual*, it seems time that we learn what actually grows in the Province. Furthermore, in spite of the rather extreme generalization of Professor Sommers, that "The subarctic character of our [Nova Scotian] flora will be observed from a study of our list" and the fact that the list has less than forty subarctic species and that this and other lists indicate a prevailingly Canadian and Alleghenian flora with forests of spruce, larch, fir, white pine, red pine, canoe birch, white ash, sugar maple, American elm, beech, red oak and hop hornbeam, we had a few indications of the presence in Nova Scotia of southern coastal plain plants,—just enough to stimulate the imagination.

The best known example of the very few characteristic coastal plain plants which we knew to be in Nova Scotia is *Schizaea pusilla*, the famous Curly Grass of the New Jersey pine barrens and of the Newfoundland barrens, an isolated representative in eastern North America of a large genus of the tropics and the southern hemisphere. Between the pine barrens of New Jersey and Nova Scotia *Schizaea* is quite unknown, although repeatedly sought on Long Island, Nantucket and Cape Cod, and in peninsular Nova Scotia its occurrence has rested solely upon a single colony discovered in July, 1879, by Mrs. Britton,[1] whose station was very limited for, as she has reported, she "collected . . . nearly all there were" and "Prof. Mackay, of Nova Scotia, has since searched in the locality where I found it, but in vain."[2] Subsequently *Schizaea* has been found on the barrens of Cape Breton by Nichols, but not on the mainland of Nova Scotia.

Another coastal plain plant, the Inkberry, *Ilex glabra*, was in Lindsay's *Catalogue*, on the authority of Sommers, as found at Halifax; but, with no specimens known from east of Massachusetts, the record seemed too doubtful and the species was excluded by Macoun in 1883 from Part 1 of his *Catalogue of Canadian Plants*. In 1886, however, Macoun reinstated it, for in the meantime he had himself collected it near Halifax and received material from Shelburne.

[1] E. G. Knight, as reported in Bull. Torr. Bot. Club, vii. 1 (1880); Gray, Bot Gaz. v. 4 (1880).

[2] E. G. Britton, Linn. Fern Bull. iv. 18 (1896).

Other coastal plain plants in Lindsay's list are *Woodwardia virginica*, *Corema Conradii* and our two species of *Hudsonia*, Nova Scotian specimens of which have been well known, and the following for which vouchers have been lacking: *Cupressus* (now *Chamaecyparis*) *thyoides*, *Eriocaulon decangulare*, *Xyris bulbosa* (now *X. torta*), *Juncus marginatus*, *Ilex opaca*, *Solidago odora* and *Coreopsis* (now *Bidens*) *discoidea*.

The latter list has always been treated as based on errors of determination, although the verification of the occurrence in Nova Scotia of *Ilex glabra*, the fully authenticated occurrence there of *Schizaea pusilla* and the recent discovery[1] there of a single plant of the Golden Crest, *Lophiola*, a genus supposed to reach an isolated northern outpost in the pine barrens of New Jersey, have tended to render Lindsay's list less incredible. Furthermore, we must not forget that specimen of *Ceratiola ericoides* Michx.[2] recorded as long ago as 1842 by Edward Tuckerman. *Ceratiola* is a monotypic genus of shrubs of the *Empetraceae*, supposed to be restricted to pine barrens from South Carolina to Florida and Alabama. But Tuckerman, in recording the occurrence in Lambert's herbarium of *Corema Conradii* (as *Oakesia*), said to have come from "Newfoundland, Cormack," appended this important note:

"The small label at the top of the sheet which contains this specimen (apparently not original) reads as follows:—'*Cistus? from Nova Scotia.*' Above has been written by the late Prof. Don '*Ceratiola cericoides* [*ericoides*],' in the same envelope with a fine and *female* specimen of which plant it is, singularly, placed."[3]

Whether the *Ceratiola* actually came from Nova Scotia had, of course, long been in doubt, but in view of other pine barren species demonstrated to occur there, the shrub was worth keeping in mind.

Altogether, the list of southern coastal plain plants reported from Nova Scotia numbered between 30 and 40, some of them without vouchers; others, like *Schizaea pusilla*, *Lophiola* and *Ilex glabra*, supported by actual modern specimens. They had all been discovered or reported at scattered intervals and mostly by different observers and it seemed apparent that they must be extremely loca plants. In view of the occurrence, especially in eastern Newfound-

[1] See Nichols, Rhodora, xxi. 68 (1919).
[2] In this report the authors are included only for species not in Gray's Man., ed. 7.
[3] Tuckerm. in Hook. Lond. Journ. Bot. i. 445 (1842).

land, of a large coastal plain element,[1] and the fact that several such species, unknown in adjacent New Brunswick and eastern Maine are obviously isolated on Nova Scotia as remnants of the flora which in the late Pleistocene or even later had lived on the then elevated but now submerged continental shelf, it became very evident that not only was there plenty of good botanizing left in peninsular Nova Scotia but that the region must hold some secrets of profound importance to a clear understanding of the history of life in eastern America.

And since the least botanized and least cultivated region of the peninsula happens to be the area of highly silicious and mostly acid quartzites and slates extending from Digby County around the coast via Yarmouth and Shelburne to Halifax, thence on to Canso, constituting the "gold-bearing series" of the province, and the great granite masses which are interspersed through the quartzite area, it seemed probable that good results would be obtained by devoting a season to these formations. The silicious rocks of the gold-bearing series are essentially identical with the Avalonian formation of southeastern Newfoundland, where have been found many species isolated, some from the South, some from Atlantic Europe. In the silicious regions of Cape Cod and of Newfoundland the most fruitful habitats have always proved to be the boggy barrens and the pond-shores and, upon studying the detailed topographic maps of Nova Scotia, it was consequently a most promising sign, to find that in the belt of Avalonian and granitic rock there are no fewer than 2,600 lakes and fresh-water ponds, as well as an endless profusion of bogs, savannahs and barrens, vastly more than in the other half of the province, where a count shows fewer than 800 lakes.

There was, therefore, no further doubt about the region to be explored and a summer's campaign was made possible through the liberal support of such generous friends as Colonel John E. Thayer and Mr. Walter Deane and the cooperation of Dr. William McInnes, Directing Geologist of the Geological Survey of Canada, and of Mr. R. R. Farrow, Canadian Commissioner of Customs. Through the helpful interest of Professor Kenneth G. T. Webster of Harvard University and his brother, Dr. Charles Webster of Yarmouth, a suitable home with a dry barn was secured in the latter town and,

[1] See Fernald, Rhodora, xiii. 135–162 (1911); Am. Journ. Sci. ser. 4, xl. 17 (1915); Am. Journ. Bot. v. 238 (1918).

as it seemed quite appropriate that the flora of New Scotland should interest botanists of New England, invitations were sent to a number of members of the New England Botanical Club to join for such time as they could during the summer in making as complete a survey as possible of the vascular flora of western Nova Scotia. Altogether there were eight in the party,[1] though not all at one time. 5000 sheets of drying paper, nearly as many corrugated "ventilators," a large stock of white pressing paper, seven large collecting boxes, ten presses, a bushel of flake naphthaline (to keep out mold and hasten drying of "soggy" specimens) and the other necessary equipment (to the extent of 16 heavy freight boxes) were shipped from the Gray Herbarium to Yarmouth, where they are entered as consigned by "Messrs. Grey, Hubanning & Co., Boston;" and on July 1st four members of the party left Boston. I was slightly delayed in starting and saw Bissell, Long and Linder leave on the early-morning train without me, to be joined en route by Pease. Their first landing in Nova Scotia was at Digby, where, waiting for the train to Yarmouth, they made the acquaintance of the village weeds and collected for the first time the beautiful Ladies' Mantle, *Alchemilla vulgaris*,[2] afterward found to be one of the most obnoxious though handsome weeds of western Nova Scotia; *Sedum stoloniferum*, then only in bud, but later, when its pink petals were expanded, seen along several roadsides around the coast as far as Barrington; and *Silene gallica*, a somewhat unusual ballast weed. On the marshes *Puccinellia maritima*[3] was in fine condition, a characteristic plant of Massachusetts marshes, afterward found to be very generally distributed on the coast of Nova Scotia.

When I arrived on July 6 at Mrs. Frank Davis's, where we had most comfortable and home-like quarters, presses of specimens were out-doors by the barn enjoying one of the last sunnings for several weeks. In the absence of maps, which were in my trunk, the advance

[1] The members of the party and the periods of their stay in Nova Scotia follow.
Ralph C. Bean, July 16–July 30.
Charles H. Bissell, July 2–July 23; August 11–September 2.
Merritt L. Fernald, July 6–September 9; October 6–8.
Dr. and Mrs. Charles B. Graves, August 10–August 24.
David H. Linder, July 2–September 9; October 6–8.
Bayard Long, July 2–September 9.
Arthur Stanley Pease, July 2–July 21.
Donald White, July 16–August 6.

[2] See Fernald & Wiegand, Rhodora, xiv. 232 (1912).

[3] See Fernald & Weatherby, Rhodora, xviii. 6 (1916).

guard had conscientously weeded the wharves and roadsides of Yarmouth, so that we should not later have them much on our minds: *Alopecurus geniculatus* and *Myosotis scorpioides* in the ditches; *Rumex Acetosa*, with its tall red wands, picturesque in the fields; *Achillea Millefolium*, mostly with deep rose-colored rays, common by roadsides; numerous garden-escapes,—*Convallaria majalis*, *Salix purpurea* in great abundance, *Crataegus monogyna* Jacq., the ubiquitous hawthorn of hedges, *Iris Pseudacorus* well established by many pools, *Lysimachia punctata* and *Veronica longifolia* in numerous thickets, and, it would seem, almost every hardy garden perennial, here luxuriating in the foggy and misty atmosphere and spreading freely to the roadsides; and, in rubbish, such unusual plants as *Vicia angustifolia* Reichard, var. *uncinata* (Desv.) Rouy & Foucaud, which Wiegand and I had found on the Maine side of the Bay of Fundy,[1] and a dwarf variety of *Trifolium pratense*, with low stems (1–2 dm. high) and very small leaves with rounded obovate leaflets only 0.5–1.5 cm. long, a plant which J. F. Collins, Pease and I had found naturalized at various points near the tip of the Gaspé Peninsula in 1904 and which seems to be referable to the European var. *frigidum* Gaud.[2]

In more natural habitats they had been getting, on springy and peaty slopes, many good things: *Carex paniced* and *C. leporina*, both rare species in North America, and *Sieglingia decumbens* (L.) Bernh., the characteristic Heath Grass of peaty soils of western Europe, also common on boggy slopes in eastern Newfoundland,[3] but not generally recognized as occurring on the American continent. Here, as elsewhere in Yarmouth County, it was invariably in half-natural habitats where it might be indigenous, but always too near civilization and pastures for us yet to feel confident that it is native. It is a neat grass, forming dense tussucks, with slender, wiry culms, and inflorescences which superficially so suggest *Danthonia* as to explain why Linnaeus placed this plant in that genus. The open places were bright with three or four species of *Sisyrinchium*: the common northern *S. angustifolium* and, quite as common if not more general, the two southern species, *S. graminoum* and *S. atlanticum*. The

[1] See Fernald & Wiegand, Rhodora, xii. 140 (1910).

[2] *T. pratense* L., var. *frigidum* Gaud. Fl. Helvet. iv. 582 (1829). *T nivale* Sieb. Herb. Fl. Austr. no. 236, acc. to Koch. *T. pratense*, γ *nivale* (Sieber) Koch, Syn Fl. Germ. 168 (1835).

[3] See Fernald, Am. Journ. Bot. v. 229, fig. 13, and 243 (1918).

former of these two extends to Newfoundland,[1] but west of Nova Scotia reaches its northeastern limit in the lower Penobscot valley; while *S. atlanticum* has heretofore been unknown northeast of southern York County, Maine. On open gravelly soil Pease and Linder had also found a plant which so closely matches *S. arenicola* of the sands of New Jersey, Long Island and Nantucket that there can be little question as to its identity. The Yarmouth material, however, seems like a starved *S. gramineum* with the short and stiff basal fibres (one of the chief characters) persistent perhaps through a response to ecological conditions, while material which Pease, Long and I subsequently found on dry plains at Middleton, Annapolis County, seems like *S. angustifolium* except for the stiff and persistent tufts of basal fibres. May it not be that *S. arenicola*, instead of being a true species, is an ecological state due to the sandy substratum in which it grows?

But still more interesting was the discovery that the spruce bogs, besides having the plants one would naturally expect (the boreal *Carex paupercula*,[2] *C. pauciflora*, *Smilacina trifolia*, *Vaccinium Oxycoccus*, *Empetrum nigrum*, etc.), shelter along with the already well known coastal plain *Carex atlantica* Bailey (*C. sterilis* of the Manual)[3] and *C. exilis*, the delicate little southern *C. Howei* Mackenzie,[4] the plant treated in the 7th edition of Gray's *Manual* as *C. scirpoides*, var. *capillacea* but clearly a distinct species of the coastal plain. *C. Howei*, which extends in New England north to the lower Merrimac, is from Cape Cod southward one of the dominant plants of the so-called Louisianian and Carolinian Cypress (*Chamaecyparis*) swamps, but throughout western Nova Scotia it is quite as dominant a sedge of the "Hudsonian" spruce swamps (fig. 1). Another

[1] See Bicknell, Bull. Torr. Bot. Cl. xxvii. 238 (1900) and Fernald, Am. Journ. Bot. v. 243 (1918).

[2] There seems no good reason to recognize vars. *irrigua* (Wahlenb.) Fernald and *pallens* Fernald. Fifteen years of field-work since they were proposed shows them to be only trivial variants.

[3] *C. sterilis* Willd. has been variously misunderstood, but Mackenzie (in Britton & Brown, Ill. Fl., ed. 2, i. 377) seems to have reached a satisfactory solution of its identity: a very distinct but little-collected species of limestone regions from Newfoundland and Anticosti westward to Minnesota, and south through the limestone region of western New England to northern New Jersey, Pennsylvania, etc. This plant, until recently merged with *C. interior* Bailey (*C. scirpoides*, at least of my own treatments), differs from it in having very rough beaks which barely exceed the broad and very long brown scales. The coastal plain plant which I have called *C. sterilis* is mostly *C. atlantica* Bailey.

[4] Mackenzie, Bull. Torr. Bot. Cl. xxxvii. 245 (1910).

southern sedge which they had been finding common in swales, and which we afterward saw everywhere we went in the Avalonian formation but nowhere else, is the characteristic plant of swamps of southern New England, *Carex bullata*, var. *Greenei*, found from Georgia north to York County, Maine, but like *C. Howei* and *Sisyrinchium atlanticum* not previously known to occur in Canada.

On July 7 we started explorations a little more remote from Yarmouth; Bissell, Pease and Linder going to the local summer resort, Lake Annis, where *Ilex glabra* and *Smilax rotundifolia* had been reported, and from there walking north a few miles to Hectanooga station; Long and I going to Meteghan station to explore an extensive spruce and larch bog, the "caribou barren," which we had noted from the train. On the way north, as we closely watched the country from the car-windows, we were puzzled to understand how the *Smilax* and the *Ilex* could be found in this region of spruce, fir and larch forest and cold boggy barrens and as this impression grew upon us we did not hesitate to express great scepticism, for it seemed so obvious that, if *Smilax*, *Ilex glabra* and *Schizaea* really did occur in this Canadian and Hudsonian region, they must lurk in some very localized pockets not visible from the train.

The Lake Annis party failed to locate either of the specialties and brought back a very characteristic lot of plants of ordinary spruce woods and bogs, with the first Dwarf Mistletoe, *Arceuthobium pusillum*, of the season, although later the "arceuthobiate" spruces were regularly seen and as the season advanced we secured beautiful material of the parasite which made these first specimens seem hardly worth preserving. They also had *Senecio Robbinsii*, which we had seen abundantly from the train, this beautiful species apparently everywhere replacing *S. aureus* in the extensive silicious region. They had the southern High-bush Blueberry, *Vaccinium corymbosum*, in perplexing variety; *Pyrola rotundifolia*, var. *arenaria* Mert. & Koch, which we had known from Newfoundland[1] but not farther south, although we continued through the summer to find it, always rather scarce, on sandy barrens as far east as Middleton, Annapolis County; and wonderful material of the fructiferous *Equisetum limosum*, forma *polystachium* (Brueckn.) Doell.[2]

Starting south from Meteghan station, Long and I quickly found ourselves seduced into collecting *Rubus*, a genus which he and the

[1] See Fernald, Rhodora, xxii. 122 (1920).
[2] See Fernald & Weatherby, Rhodora, xxiii. 77 (1921).

others had nobly attended to around Yarmouth; but after nearly filling out man's size collecting boxes with blackberry canes, we were attracted by a very handsome and distinct *Antennaria* on the dry embankment, the foliage suggesting very large *A. neodioica* but the large heads with a strong crimson tinge suggestive of *A. Parlinii*. This was something neither of us had ever seen growing, so we compressed the blackberry specimens (and made a necessary screen over them with large leaves) to make room for a fine lot of the *Antennaria*, and whenever we subsequently saw it, as we did several times and as far east as Hants County, we were regularly struck with its great beauty. The plant proves to be my own *A. neodioica*, var. *grandis*, a well marked extreme of a polymorphous species, which I had known only through herbarium material; and, although in the field it looks very distinct, I am unable to find a single character by which it can be specifically separated.

Striking out into the wet mossy bog we were interested to find *Potentilla canadensis*, var. *simplex* of dry fields in New England and the eastern States generally and the Checkerberry, *Gaultheria procumbens*, of our dry pastures and woods, growing in deep, wet sphagnum along with the other bog plants, *Andromeda glaucophylla*, *Kalmia polifolia*, *Carex paupercula*, *C. pauciflora*, *Eriophorum angustifolium* and *Vaccinium Oxycoccus;* but we were not wholly surprised, for Long had been collecting the *Potentilla* in wet bogs about Yarmouth and I had known *Gaultheria* as a wet-bog species on the Gaspé Peninsula.[1] Crossing the bog, we soon came into carpets of the arctic Crowberry, *Empetrum nigrum* (fig. 2), common enough at Yarmouth, but here in the cold bog retaining its flowers unusually late into the summer, still in such good condition that we had the satisfaction for the first time in our experience of securing good staminate material. And there close to *Empetrum*, right in the middle of an otherwise almost typical Hudsonian bog was the Inkberry! We could hardly believe our eyes but there was the glossy-leaved *Ilex glabra* (fig. 3), much smaller than on Cape Cod or in New Jersey, Florida or Alabama, but healthy and just beginning to bloom. In the spruce woods at the edge of the bog the High-bush Blueberries were as perplexing as on Cape Cod or in New Jersey, but here there were some forms which we had not previously met.

After a day of work on the presses we were ready to try the country southward, Long and Pease ("Longipes" of our field-notes) trying

[1] See Fernald, Rhodora, xiii. 97 (1911).

the region of open, boggy barrens east of Argyle Head; Bissell, Linder and I examining the granitic coast of extreme southwestern Nova Scotia at Shag Harbor. We got into a typical Hudsonian bog region like bits of the outer coast of eastern Maine[1] or of Newfoundland, with their great abundance of Bakeapple (*Rubus Chamaemorus*), *Carex pauciflora*, *C. trisperma*, var. *Billingsii*, *Empetrum nigrum*, and swales of *Eriophorum callitrix* or interrupted turf of *Scirpus cespitosus*, var. *callosus* Bigelow.[2] Around the shores were the usual coastal plants of this latitude, such as *Elymus arenarius*, var. *villosus* E. Meyer,[3] *Coeloplеurum lucidum* (L.) Fernald,[4] and *Euphrasia purpurea* Reeks, var. *Randii* (Robinson) Fernald & Wiegand, but here apparently all belonging to the white-flowered forma *albiflora* Fernald & Wiegand;[5] and the only traces of a coastal plain flora noticed were the ubiquitous *Sisyrinchium atlanticum*, *Carex atlantica* and *C. bullata*, var. *Greenei* and the almost ubiquitous Bog Huckleberry, *Gaylussacia dumosa*, var. *Bigeloviana* Fernald,[6] northern log variant of a wide-ranging coastal plain species.

But when, returning to Yarmouth, Long and Pease joined us on the train, although they had some boreal species, such as *Scirpus cespitosus*, var. *callosus* and *Carex oligosperma* (boreal, but found on Cape Cod), they showed a very different lot of plants from the bog-barrens east of Argyle Station and the peaty and sandy soil about Sand Pond. They were beaming over the prompt discovery of *Schizaea pusilla* (fig. 11), a young *Bartonia*, a young *Xyris* suggesting the coastal plain *X. caroliniana* and, in flower, the northern representative of the genus, *X. montana*, a young *Solidago* of the subgenus *Euthamia*, obviously related to the coastal plain *S. tenuifolia*, *Eleocharis Robbinsii* of coastal plain sloughs south to Florida, *Panicum spretum*, a common species of the coastal plain south to Texas, *Calamagrostis Pickeringii*, var. *debilis* Fernald & Wiegand, heretofore unknown[7] between eastern Massachusetts and Newfoundland, *Lycopodium inundatum*, var. *Bigelovii* (*L. adpressum* (Chapm.)

[1] See Fernald & Wiegand, Rhodora, xii. 106 (1910); Knowlton, Rhodora, xvii. 148, 149 (1915).
[2] See Fernald, Rhodora, xxiii. 24 (1921).
[3] See St. John, Rhodora, xvii. 99 (1915).
[4] Rhodora, xxi. 146 (1919).
[5] Rhodora, xvii. 188 (1915).
[6] Rhodora, xiii. 99 (1911).
[7] Rhodora, xv. 135 (1913).

Lloyd & Underw., *L. Chapmani* Underw.),[1] a coastal plain extreme of the species extending from Louisiana via Florida to eastern Massachusetts but heretofore unknown northeast of Plum Island and the famous Round Pond at Tewksbury (Massachusetts), where it is one of a very notable group[2] of isolated coastal plain plants; and, best of all, the tiny bladderwort, *Utricularia subulata*, both the showy form with expanded orange corollas and the cleistogamous state with minute creamy or whitish flowers; for *Utricularia subulata* is one of the most characteristic plants of wet barrens all the way from Brazil, via the West Indies, to southern New Jersey, north of there an exceedingly rare species, known from a single station on Long Island and very locally indeed on Martha's Vineyard, Nantucket and Cape Cod (fig. 4). This was indeed pretty thrilling and our excitement, as we were shown one after another the different finds, quickly stimulated the curiosity of the brakeman, who stopped for a lesson in a subject obviously quite new to his experience.

In his account of the distribution of forest trees of Canada, Robert Bell stated that the northern White Cedar, *Thuja occidentalis*, "is absent from . . Nova Scotia;"[3] and in his enumeration of the trees of Nova Scotia, Fernow[4] does not list the species. But in

[1] Many botanists maintain as distinct species the circumpolar *L. inundatum* and the endemic American coastal plain *L. adpressum* and *L. alopecuroides*, although in Britton & Brown's *Illustrated Flora* (ed. 2, i. 44) *L. inundatum*, var. *Bigelovii*, the type of which is quite identical with Georgia, Florida and Louisiana specimens of *L. adpressum*, is treated as a variety of *L. inundatum*: "Slender elongate forms, mainly from New England . . . ; they indicate a possible transition into the next species [*L. adpressum*]." On Cape Cod and in Nova Scotia the transition is very apparent and no sharp specific line can be drawn between *L. inundatum* and *L. adpressum*. *L. alopecuroides*, with its great development of bristly ciliation, would seem, from its more typical specimens, to be well marked, but in his *Plants of Southern New Jersey* Stone says (p. 141): "We certainly have a chain of connecting links in our New Jersey bogs between *L. chapmanii* [or *L. adpressum*] and *L. alopecuroides*." It is thus apparent that, in 1843, Tuckerman worked out the proper treatment of these plants:

"*L. inundatum* . . . .—β. *Bigelovii*, (mihi): majus, ramis subramosis elongatis, foliis acuminatis sparsim denticulatis s. integris. *L. Carolinianum*, Bigel. Fl. Bost. p. 384.—γ. *alopecuroides*, (mihi): caule ramisque ut β. foliis lineari-subulatis basi sparsimque ciliato-dentatis. *L. alopecuroides*, L. . . . (β.) Wet, sandy margins of ponds; Plymouth, Oakes and Tuckerman; (also New Jersey?).—(γ.) Florida, Torrey. . . . The variety *alopecuroides*, if this view be correct, is the extreme southern American form of the species, the variety *Bigelovii* intermediate, and perhaps not occurring north of Massachusetts, and α. the extreme northern state, common to us with Europe."—Tuckerm., Am. Journ. Sci. xlv. 47, 48 (1843).

[2] See Fernald, Rhodora, xiii. 247 (1911).

[3] R. Bell, Geol. Surv. Can. Rep. for 1879–80, 47C (1881).

[4] Fernow, Forest Conditions of Nova Scotia, 11 (1912).

Lindsay's *Catalogue* it is recorded from Cumberland County, north of the main peninsula of Nova Scotia and Professor H. G. Perry has reported it[1] as scarce in the west-central portion of the province. Lindsay also records the coastal plain Cypress or Cedar, *Chamaecyparis*, and Nichols has surmised[2] that a reputed Juniper on Digby Neck may prove to be *Chamaecyparis*. Consequently, when we discovered on Fernow's map that in Digby County there are two bodies of water called "Cedar Lake," one at the head of Tusket River, east of Corberrie, the other, lying partly in Yarmouth County, northeast of Port Maitland, and giving the name to Cedar Lake post-office, we promptly made inquiries about the tree which had suggested the name. The inquiries, as usual, were fruitless, so on the afternoon of July 11, having time for a short ride, we went by automobile to the nearer (the latter) Cedar Lake to settle the question ourselves. On the way we paid our respects to *Rubus*, especially to one ugly old brier with a profusion of fierce prickles, glands and hispidity, the dominant blackberry of the region, which was promptly dubbed by our *romantic* classicist "*filius diaboli*," a shrub strongly simulating the coastal plain *R. Andrewsianus* Blanchard but with strongly hispid as well as prickly and glandular canes.

On a roadside near Darling Lake was the small yellow clover, *Trifolium dubium*, a common weed from Cape Cod southward, afterward found by us at other stations in Yarmouth County as far south as Belleville. North of Port Maitland the road passed near the southern end of Beaver Lake and we were so attracted by the tremendous inundated swale at its border, that we felt justified in taking a few minutes from the short time available for Cedar Lake to sample it. The swale was a typical one, with a profusion of *Scirpus acutus* Muhl.,[3] *Cladium mariscoides*, *Panicum spretum*, *Carex polygama*, *Pogonia ophioglossoides*, etc., and with them the usually maritime *Triglochin maritima*, here in highly acid peat.

As we approached Cedar Lake we came upon a swale showy with *Potentilla fruticosa* which we had not seen before and which, with its predilection for neutral or even calcareous soils, suggested that if any cedar still grew in the region it would be *Thuja*. Accordingly we were prepared, as the road came close to the lake, for the beautiful

[1] See Fernald, Rhodora, xxi. 55 (1919).
[2] G. E. Nichols, Rhodora, xxi. 68 (1919).
[3] See Fernald, Rhodora, xxii. 55 (1920).

growth of *T. occidentalis* which fringes the southwestern banks of the lake. It was not so thrilling a sight as a *Chamaecyparis* swamp would have been but it definitely disposed of the tradition that *Thuja* does not grow in Nova Scotia. The belt of cedar is only a few yards wide, extremely localized, and it is probable that morainal material at that point, derived from the basaltic Digby Neck to the north, would account for this localized colony of *Thuja* in a dominantly acid region.

The lower peaty and gravelly margin and beach of the lake had the usual plants of the lake-shores: *Carex lenticularis, Lobelia Dortmanna, Eriocaulon septangulare, Isoetes sp., Panicum spretum, Gratiola aurea*, etc., with *Botrychium simplex* forming a characteristic little patch at one point in the dry gravel; trees of the coastal plain *Acer rubrum*, var. *tridens* mingled with the common northern form of the species; and abundant in the gravel were great colonies of a pale-pink *Pogonia ophioglossoides* with the perianth not expanding as it does in the plant of bogs. Upon digging specimens we found that this characteristic gravel-beach plant is almost cespitose, the root-fibres extensively creeping and sending up at frequent intervals oblong leaves or flowering stems. Closer examination showed the lip to have no beard such as is conspicuous on the lip of the common bog plant or to have the beard represented only by extremely short processes; but, although we often found the plant at other lakes, there were transitional tendencies which show that it is only varietally separable.

The next day, July 12, after getting the Cedar Lake collection cared for and the presses in order, there was time for a short afternoon's collecting, so Long and Pease walked eastward to Arcadia, Linder and I south to the salt marshes and gravel beaches at Sand Beach. Puccinellias were in their prime, tantalizingly variable in stature and aspect, from 1.5 dm. to practically 1 m. tall, with dense or lax inflorescences but in technical characters all referable to *P. maritima*, the species already collected at Digby, common on Cape Cod, but in Maine unknown east of Casco Bay. *Agropyron*, too, as on the coast of New England and about the Gulf of St. Lawrence, was perplexingly variable and the group surely needs a master's hand, for altogether too many plants, both native and introduced, are passing under the blanket-name *A. repens*. A very pretty white-flowered form of the Sea Lungwort or Oyster-plant, *Mertensia mari-*

tima, was on the barrier beach, and back of the beach were two salt-marsh coves with boreal and austral halophytic sedges wonderfully mingled: in one cove the arctic *Carex norvegica* forming a pale turf close beside a tall colony of the austral *Scirpus Olneyi*, a characteristic species of such habitats from the West Indies and northern Mexico to the coast of New Hampshire; in the next cove a similar mingling of the boreal *Scirpus rufus*, previously unknown south of Cape Breton and the Magdalen Islands, and the curious "walking" sedge, *Eleocharis rostellata*, extending north from Mexico and Cuba to Massachusetts, and heretofore unknown east of an isolated northern station in Sagadahoc County, Maine.

Long and Pease had gone a mile or so beyond Arcadia village to the shores of Porcupine Lake,[1] where in the sphagnous margin of a rill they had again found *Schizaea pusilla*, there associated with *Arethusa bulbosa* and very young specimens of a *Bartonia*. On dry gravel they had collected *Panicum subvillosum*, which soon proved to be one of the commonest species of the province, and *Antennaria petaloidea*, var. *subcorymbosa* Fernald,[2] a characteristic plant of eastern Newfoundland, Prince Edward Island and Nova Scotia, locally westward to the lower Penobscot in Maine, and found in very typical form by Bicknell on Nantucket.[3]

They also brought in very characteristic material of a tall shadbush with the young leaves densely tomentose, the mature elliptic-oblong and acute, sharply and somewhat remotely toothed and obviously not like those of *A. oblongifolia*, so common in southern New England, but with ascending calyx-lobes much as in that species. They had been collecting the same thing before my arrival and afterward we found it one of the commonest large shrubs as far east as Queens and Annapolis Counties, either in peat or gravel. This material exactly matches the numerous specimens in the Gray Herbarium which Wiegand has identified as *Amelanchier intermedia* Spach,[4] as do specimens of a characteristic tall shrub of Prince Ed-

[1] The name Porcupine Lake is applied by the people of Yarmouth County to the unnamed lake of the topographic map slightly east of Arcadia; while the next lake to the east, called Porcupine Lake on the map, is universally known as Trefry's Lake.

[2] Rhodora, xvi. 133 (1914).

[3] Bicknell, Bull. Torr. Bot. Cl. xliii. 267 (1916); xlvi. 437 (1919): "Such plants of Nantucket as . . . and *Antennaria petaloidea*, var. *subcorymbosa* would scarcely be looked for from elsewhere than far to the east."

[4] See Wiegand, Rhodora, xxii. 147 (1920).

ward Island. Wiegand treats the species as belonging to the Piedmont and Alleghenian regions from Vermont and New York to North Carolina, there occurring chiefly in bogs. Its abundance in Nova Scotia and Prince Edward Island on either damp or dry soils suggests that it may be a Canadian species which southward takes to the bogs.

We were gradually growing into the habit of spending all our mornings in the barn caring for the presses and on July 13 it was, therefore, afternoon before we got away, all five of us by automobile, with the avowed purpose of going inland to Carleton or to Kemptville. Not far from Yarmouth we were tempted by a little pondlet, dignified by the wholly undistinguishing name Lily Lake, to stop long enough to "size up" the place, a bog-pond with quaking bushy margin, where we collected for the first time *Rosa palustris* Marsh.[1] and deep in the spruce thicket immature but thoroughly characteristic *Thelypteris simulata* (Davenp.) Nieuwl. (*Aspidium simulatum*),[2] heretofore unknown east of southern Maine but afterward found to be quite general on bog-barrens, in spruce swamps or in alder-thickets as far east as we worked in the Avalonian formation (Port Mouton and Broad River). This southern fern was growing with its regular southern associates, *Carex atlantica* and *C. Howei*, and nearby were the ubiquitous *Carex bullata*, var. *Greenei*, and *Thelypteris Boottii* (Tuckerm.) Nieuwl.,[3] which soon proved to be a common fern.

The next stop was a brief one, to prospect a little about the shore of Greenville (or Salmon) Lake. The water was high but *Isoetes*, as usual wherever we went, was already well fruited; *Xyris caroliniana* was becoming really recognizable; and, abundant in the boggy thicket, where in Maine or New Brunswick we should expect *Galium trifidum*, was the larger and smoother *G. tinctorium*, again a southern species not previously known northeast of Massachusetts.

We had gone but a short distance up the west bank of the Tusket River when, at Tusket Falls, we spied an extensive tidal flat, one of those "demd damp, moist, and unpleasant" stretches of ooze and slimy mud which is always sought by the properly enthusiastic field-botanist, for here there is good collecting. The tidal flats at Tusket Falls do not equal some in New England nor those on the

[1] See Fernald, Rhodora, xx. 91 (1918).
[2] See Weatherby, Rhodora, xxi. 174, 178 (1919).
[3] See Weatherby, Rhodora, xxi. 174, 177 (1919).

lower Delaware, but they are good, giving us *Samolus floribundus*, *Juncus acuminatus*, the first east of the tidal reaches of the Penobscot, and *Myriophyllum humile*, again the first east of the lower Penobscot.[1]

Continuing up the valley, we saw much of a Staghorn Sumach, *Rhus typhina*, but here and, as we afterward noted, at some other stations in Nova Scotia, the pubescence of the branches is remarkably short and scanty, sometimes nearly wanting. At other stations, however, the pubescence is quite as long as we find it southward, so that there seems to be no constancy in the Nova Scotia variation. Somewhat north of Tusket (or Vaughan) Lake we again came upon the Inkberry, *Ilex glabra*, which had so amazed Long and me when we found it with *Empetrum nigrum* in the bog at Meteghan. But here it was dominant over a considerable area, not of bog, but of dryish rocky barren, associated with *Vaccinium pennsylvanicum*, *Myrica carolinensis* and the same handsome *Antennaria neodioica*, var. *grandis* which we had collected at Meteghan.

Our time was used up and we had not reached Carleton, but we were content with the afternoon's work and ready to return home. On the way back from the Tusket valley we had seen at several places roadside colonies of a tall Lupine, but our driver informed us that at Chebogue Point lupines covered many acres of hillside. Accordingly, on the afternoon of July 14 we drove to the Point to see them, one of the famous sights of Yarmouth County, great masses higher than one's head of blue-violet (occasionally pink or white) lupines covering the dry roadside-banks for a tremendous distance, two thoroughly naturalized species from northwestern America, *Lupinus nootkatensis* Donn and *L. polyphyllus* Lindl., both already known[2] as naturalized plants in the Maritime Provinces, but here growing intermingled and apparently freely crossing.

On the return Bissell took home the material already collected and the rest of us walked from Rockville back to Yarmouth, Pease and Linder by the eastern shore of the Chebogue peninsula, where they found more *Eleocharis rostellata* and with it *Galium trifidum*, var. *halophilum* Fernald & Wiegand,[3] thus proving that that northern

[1] Nichols reports *M. humile* as characterizing the sandy margins of lakes on Cape Breton (Nichols, Veg. No. Cape Breton, 350) but, as he now informs me, this record was based on the common lake-margin *M. tenellum*.

[2] See Fernald, Rhodora, xvi. 94 (1914).

[3] Rhodora, xii. 78 (1910).

species is not everywhere replaced in western Nova Scotia by the coastal plain *G. tinctorium*. Long and I followed the western shore of the peninsula nearly to the point at Sand Beach where, a few days earlier, Linder and I had stopped collecting. Along spring-rills everything was luxuriant and in such a habitat we collected *Eleocharis capitata*[1] exceeding in stature and length of spikelet the ordi-

[1] Dr. S. F. Blake has shown (Rhodora, xx. 23) that the Linnean *Scirpus capitatus* has been misinterpreted and that the Clayton plant upon which it was primarily based is the familiar *Eleocharis tenuis* (Willd.) Schultes. Dr. Britton (Torreya, xix. 246) doubts this identification of the type of *S. capitatus*, saying: "It seems incredible that Linnaeus could have meant to describe the spikelet of that sedge as subglobose and to have assigned the name *capitata* to it. Linnaeus reached some results which seem queer to us . . . . but these flukes are brilliant as compared with calling the spikelet of *Eleocharis tenuis* subglobose."

The Linnean description of the spikelet of *Scirpus capitatus* is, indeed, "spica subglobosa," but so is his description of the spikelet of the first species on the page (Sp. Pl. i. 48), *S. geniculatus*: "spica subglobosa." No difference between the two descriptions is apparent; nevertheless, no one, so far as I am aware, applies the name *S. geniculatus* or *Eleocharis geniculata* to any other than the tropical plant with as elongate-lanceolate or slender-cylindric a spikelet as can be found in the genus. Surely, if the latter plant, with a very elongate spikelet, could be described by Linnaeus as having the "spica subglobosa," it should not seem incredible that he so described the ellipsoid to ovoid spikelet of *E. tenuis*.

In the same note in which Dr. Britton expresses his amazement at Linnaeus's description of *Eleocharis tenuis* he refers to the International Rules of Botanical Nomenclature as "forced down the throats of the Vienna Botanical Congress by a German majority and further manipulated by the same majority at the Brussels Congress," while the American Code "cuts out autocracy."

Such remarks from one of the original Commissioners who organized the Vienna Congress but who has treated the rulings of its tremendous international majority as "a scrap of paper," must seem like a huge joke to anyone familiar with the methods by which the American Code originated. The Nomenclatorial Congress at Vienna was presided over by Flahaut of Montpellier (although Dr. Britton had nominated von Wettstein), with Briquet of Geneva as *rapporteur général* (certainly neither of them Germans). There were 39 Commissioners: 4 of them from Germany, 3 from Austria and 2 from Hungary; while the remaining 30 were from non-German countries (1 from Uruguay, 2 from Belgium, 1 from Spain and Portugal, 4 from the United States, 4 from France, 4 from the British Empire, 2 from Holland, 3 from Italy, 4 from Russia, 1 from Sweden, and 4 from Switzerland); surely not a *German* majority. Nineteen authors of formally proposed motions were present, each with a single vote: 7 of them from Germany, Austria and Hungary, the remaining 12 from the United States, Switzerland, Russia, Norway, Italy, Great Britain and France; again not a *German* majority. Forty-five botanical institutions, each with a single vote, were represented: 6 German, 5 Austrian, 2 Hungarian (total 13); while the remaining 32 votes came from the following countries: Belgium 1, Denmark 1, United States 10, France 3, Great Britain 2, Holland 2, Italy 5, Norway 1, Russia 1, Sweden 3, and Switzerland 3 (total 32 as opposed to 13); again not a German majority! Seventy-two societies and academies had delegates with a total of 135 votes distributed as follows: Germany 23, Austria 9, Hungary 3 (total 35 out of 135), not an overwhelming German majority; Belgium 3, Denmark 3, Spain 4, United States 18, France 29 (more than Germany!), Great Britain 12, Holland 9, Italy 4, Norway 1, Russia 6, Sweden 2, and Switzerland 9 (total 100).

Article 20 of the International Rules, recognizing *nomina conservanda* (Art. 17*ter* of the Texte Synoptique voted upon at Vienna), the Article so offensive to certain Americans, was adopted at Vienna by a vote of 133 to 36 (a majority greatly exceeding

nary measurements of the species, the culms being 7.5 dm. high, the spikelets 1.1 cm. long. One old springy field was brilliant with the red spires of *Rumex Acetosa* and with it was a gigantic species, at first glance taken for rhubarb, but quickly perceived to be a dock, the Butter Dock or Monk's Rhubarb, *Rumex alpinus* L., a very striking European species which has turned up casually in New England but here is thoroughly naturalized.

In a roadside ditch as we approached Sand Beach village we found a remarkable form of the ubiquitous and endlessly variable *Carex scoparia*, and when we got home we found that Pease and Linder had collected the same variation at another station east of Rockville. In this peculiar form the spikes are slenderly rhomboid and tapering to very slender, almost caudate tips.

Next day, July 15, there was time for an afternoon trip and since Bissell, Linder and I had begun to feel that "Longipes" had a tantalizing ability to turn up coastal plain specialties wherever they went and since we longed to be present at some of these thrilling discoveries, a new grouping for the afternoon seemed desirable. Accordingly when we drove eastward, Bissell, Long and Linder went to Tusket and Pease and I tried the borders of the beautiful lake erroneously called on the map "Porcupine Lake" but known throughout the region as Trefry's Lake.[1]

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the Germanic vote) and the Commission appointed to decide on the list of *nomina conservanda* consisted of Bonnet (French) Britton (American), Harms (German), Prain (British) and Briquet (Swiss)—again far from a *German* majority.

The same situation is obvious to anyone who sufficiently cares for the facts to read the records of the Brussels Congress. Flahaut (French) was again president, with de Wildeman (Belgian) general secretary. Of the 54 members of the Permanent Bureau and the Commission on Nomenclature, 12 were Germans, Austrians and Hungarians; 42 non-Germans. Of the 15 authors of motions present and voting 4 were German, Austrian and Hungarian; the others (11) non-German. Of the 50 botanical establishments having votes, 12 were German, Austrian and Hungarian; 38 not. Of the 108 votes by delegates from Academies and Societies, 30 were cast by Germans, Austrians and Hungarians; 78 by representatives of other countries (including 19 American, 20 French and 15 British). That these facts, which are simple transcriptions from the official published records of the Congresses, most certainly do not represent the "autocracy" of an overwhelming "German majority" should be evident to everyone. For many years prior to the Vienna Congress tremendous effort was expended by those who sincerely wished to bring uniformity out of the very diverse usages of local groups of botanists. The effective foundation-work laid at Paris (German?) was subsequently carried forward with unlimited self-sacrifice and far-seeing skill by Briquet, Flahaut, Rendle and others; and the sportsmanlike or statesmanlike spirit with which the vast majority of delegates, representing all sorts of pet views, abandoned their private wishes at Vienna, is one of the most impressive signs that, although a few "Neo-Americans" present were unwilling to concede anything, the botanists of the rest of the world were working disinterestedly for agreemert.

[1] See note on p. 103.

Although the water was high, there was sufficient peaty, sandy and cobbly beach exposed for us comfortably to follow the margin of Trefry's Lake. At the upper border of the beach *Utricularia subulata* was so abundant as to form an interrupted orange-yellow band and with it, as at every station we subsequently found (nearly every lake visited in Yarmouth County), was *U. cleistogama*, the extreme plant with tiny creamy or milk-white or sometimes buff-tinged, spurless corollas, but with many of the flowers intermediate in size, form and color and often with short spurs. Such transitional colonies were repeatedly examined by Long and me; White and Bean, when they came, saw the two with their intermediates at Cedar Lake where White secured a beautiful photograph including the tiniest extreme (no larger than a slender "insect-pin"); and Dr. Graves, when at last he came, had his opportunity to collect the transitional series at Salmon Lake. These repeated experiences naturally destroyed the last lingering illusions that *U. cleistogama* is a species distinct from *U. subulata*. It is not even a good variety, being merely a cleistogamous form of *U. subulata*.

Since the preceding paragraph was written it has been gratifying to find that Bicknell's experience on Martha's Vineyard was so similar to our own. "Near Edgartown, on Martha's Vineyard, on September 30, 1912, there fell to me a most favorable opportunity of observing the extent of variation natural to the flowers of *S[etiscapella] cleistogama* among the plants of a single colony. The situation was a few square feet of damp sandy soil in open ground. In the weakest examples, some of them not over 1 cm. high, the corollas, 'not larger than a pinhead,' were subglobose or saccate, and white or faintly bluish in color, precisely as descriptions require them to be. But in stronger plants the corollas increased doubly in size and came also, by an exact gradation, to a distinctly two-lipped form, the blunt lower lip dusky or purplish lineate and with an evident white spur, the most open flowers showing an unmistakable yellowish tinge. The spur, obsolete in the smallest corollas, varied in the larger ones from rounded to oblong and acutish; in one instance it was bifid."

"In very small examples of *S. subulata*, unmistakable as to identity because components of colonies of the typical plant, the corolla, perhaps from arrested development, may be somewhat abortive and

reduced to a fraction of its normal size, and is sometimes palest yellow, or even whitish with a faint bluish tinge."[1]

The thickets by Trefry's Lake have a tantalizing complex of Black Alders, *Ilex verticillata* and its varieties or allies; but one of them was so unlike the ordinary forms of the species that we collected material. This proves, as we then suspected, to be the very characteristic shrub described by Bicknell from Nantucket and Martha's Vineyard as *Ilex fastigiata*,[2] an extreme of this group with fastigiate habit and very small and narrow leaves. The same shrub was afterward seen elsewhere in Yarmouth County, and in October Linder and I collected fruiting specimens on the headwaters of the Tusket. Similarly, here as at many other places in the county, the High-bush Blueberries were baffling in their variations and in working back into the boggy thicket to do our reluctant duty by them we found ourselves in a characteristic growth of the Chain Fern, *Woodwardia virginica*, a coastal plain fern already well known from Nova Scotia but not before seen by our party, though subsequently we learned to regard it a dominant plant of boggy spruce swamps at lake-margins and sometimes even of cobble-beaches.

Coming to a point where the shore was impassable, we turned back into the spruce swamp, only to find ourselves impeded by a very familiar and unyielding obstacle, a dense tangle of the long-sought Green Brier or Cat Brier, *Smilax rotundifolia; Smilax rotundifolia* with its roots in a cold sphagnous bog, its lithe, green stems embracing the branches of the Hudsonian and Canadian White Spruce and Larch quite as contentedly as if clambering over the Tupelos and *Leucothoe* of Cape Cod. And back of the Green Brier tangle, the spruce bog, with its tussocks of the northern *Carex paupercula* and *C. trisperma* and its carpets of *Linnaea*, *Dalibarda* and *Cornus canadensis*, was almost uncanny with a dense undergrowth of Inkberry, *Ilex glabra*, now in profuse bloom and swarming with bees. Incidentally, this shrub is considered in Alabama and some other southern states the most valuable wild source of honey, and from the swarms of honey bees which cover it in Nova Scotia it is apparent that it might there be made of considerable economic use.

We had not yet learned to rely on the almost regular lateness of the west-bound trains on the Halifax and Southwestern (part of the

[1] Bicknell, Bull. Torr. Bot. Cl. xlii. 341 (1915).
[2] Bicknell, Bull. Torr. Bot. Cl. xxxix. 426 (1912).

government system) and in order to catch the last train to Yarmouth were forced most reluctantly to start on the three- to four-mile tramp to Arcadia station, or, rather, walking match with Pease, the champion of White Mountain trampers, as pace-setter.

The Tusket party, of course, brought in *Ilex glabra*, a shrub the rarity of which we were beginning to doubt, and Bissell maintained that the White-fringed Orchis, *Habenaria blephariglottis* of coastal plain peats, was growing at Tusket on the ordinary, dry railroad embankment. This was a rather "jarring" assertion to those of us who knew the plant southward only in wet sands or bogs, but we afterward abundantly verified it, for from now until mid-August we constantly saw this beautiful plant with milk-white racemes in the greatest profusion, not only on wet, boggy barrens but in ordinary dry pastures, spruce thickets and dry *Polytrichum*-barrens.

Long and Linder, hoping to add to the glories of the tidal flats of the Tusket, had spent some time on the muddy banks of the river which are here decidedly more saline than farther up at Tusket Falls, the rank grasses and sedges being chiefly *Spartina alterniflora* Loisel,[1] and *Scirpus acutus*, with *Scirpus Olneyi*, *Eleocharis rostellata* and *Deschampsia caespitosa* at the brackish upper border. The mud was too saline for a great variety of species but they had their reward in *Zannichellia palustris*, var. *major*,[2] *Limosella subulata* Ives[3] and, best of all, that most amazing of all our *Umbelliferae*, *Lilaeopsis lineata*, always exciting wonder by its unique habit and habitat; the

[1] See Fernald, Rhodora, xviii. 178 (1916).

[2] In 1918 it was pointed out (Rhodora, xx. 160–164), that in America typical European *Limosella aquatica* L., although known at the Straits of Belle Isle, is mostly confined to the western sections of the continent, the plant of the Atlantic coast being *L. subulata* Ives. Similarly, the typical European *Zannichellia palustris* L. seems to occur in North America only in the western half of the continent, from Saskatchewan to Iowa, Missouri and Texas, thence west to the Pacific and south into Mexico, the plant with sessile or subsessile fruits, the body of the achene 2–2.5 mm. long. The plant of tidal or brackish pools and shores all the way from Florida to Newfoundland is var. *major* (Boenningh.) Koch, this plant having the fruit definitely pedicelled and rather long-beaked, its body 2.5–3.5 mm. long. It may have either free-swimming or closely repent stems, but throughout its range along our Atlantic coast it has the fruit-characters remarkably constant. The bibliography of our plant seems to be:

Z. palustris L., var. major (Boenningh.) Koch, Syn. Deutsch. und Schweiz. Fl. 679 (1837). *Z. major* Boenningh. ex Reichenb. in Moessler, Handb. ed. 2, iii. 1591 (1829); Reichenb. Ic. Bot. Crit. viii. 24, fig. 1005 (1830) and Ic. Fl. Germ. Helv. vii. 10, t. 16, fig. 24 (1845). *Z. intermedia* Torr. Compend. 330 (1826). *Z. palustris* Race *Z. dentata*, β. *major* (Boenningh.) Rouy, Fl. Fr. xiii. 298 (1912).

[3] See Fernald, Rhodora, xx. 160–164 (1918); also Pennell, Torreya, xix. 30–32 (1919).

stems creeping in saline mud, the leaves being erect and fleshy club-shaped bodies 2–8 cm. high. *Lilaeopsis* is one of these interesting genera of a few closely related species and a range southward through South America, but in the eastern hemisphere known only in Australia and New Zealand. But in case of the Tusket plant the usual thrill of finding this unique little plant was intensified by the knowledge that it is an addition to the flora of Canada.

Friday, the 16th, brought White in the morning by boat and Bean in the afternoon by train and an appropriate initiation was provided by setting them to work changing driers and "salivating"[1] specimens preparatory to an early start next day on a long circuit, to see the country along the southwest coast as far as Halifax and to explore various spots already noted from there to Amherst on the New Brunswick border, and westward into Annapolis County. The trip started auspiciously on the 17th, with the party increased to seven, and, as we watched the country from both sides of the train, we were "all eyes," noting countless promising barrens, lake-shores and sands for future exploration.

(*To be continued*)

[1] The "salivation" of specimens is a simple, but apparently not generally known, method of securing superior results. In my own experience, at least, the method originated impulsively at Carleton, Quebec, in July, 1904, when Collins, Pease and I were distressed at the failure of flowers of *Parnassia* and leaves of *Pinguicula* to stay opened out after the plants had received their first pressure. Impulsively tearing off a bit of newspaper and moistening it with my tongue, I applied it to the curling petals and leaves with the instant result that they were held closely to the pressing paper. These bits of paper, promptly dubbed SALIVATORS and when needed in quantity moistened in a dish of water, are now considered indispensable by those who have learned the trick and by their use nearly all obstinately curling portions of a specimen can be held in place. The slips are left in press during successive changes of driers and eventually flake off. A modification of the method is to moisten a spot on the pressing sheet when the specimen is originally put in press and on this wet spot to spread out (up-side-down) the refractory petals or leaves.

THE GRAY HERBARIUM EXPEDITION TO NOVA SCOTIA, 1920.

M. L. FERNALD.

(*Continued from p. 111.*)

WE were due in Halifax in the early evening and had counted on seeing the country all the way, but the chronic indisposition which seemed to afflict the government railroad reached its climax for the day in a rocky barren west of Bridgewater, with the result that we were many miles west of Halifax when darkness set in. During the very long and tedious stop in the rock-barren we had more to occupy our attention than did the hundred other travellers who had soon gathered all the early blueberries and lingering strawberries; and, although we should not recommend this area as the best place for the next breakdown, we took away the southern *Carex umbellata*, var. *tonsa* and *C. pennsylvanica*, var. *lucorum*, *Lycopodium tristachyum*, *Lechea intermedia*, and one of the neatest little shad bushes we ever saw, a beautiful shrub with stoloniferous habit, low stature (3–6 dm.) and nearly orbicular dark-green, highly lustrous leaves. Afterward, at Grand Lake, Halifax County, at Springhill Junction in Colchester County, at Middleton in Annapolis County and at various places westward we found it a thoroughly distinct and dominant shrub of barrens, either dry or wet. In habit it resembles *A. stolonifera* Wiegand,[1] a characteristic shrub from Maine to Virginia and in eastern Newfoundland, with dull and pale-green or glaucous foliage and with the summit of the ovary densely tomentose; but this characteristic Nova Scotian shrub with dark, glossy leaves has the summit of the ovary wholly glabrous, though it is sometimes arachnoid or sparsely pubescent. Typical *A. stolonifera* we found in Nova Scotia, though only once; but the common shrub is so well marked that it should be separated as a variety.

After a night in Halifax, where none of us got more than a few "cat naps," so insistent and obtrusive was the clang of the near-by fog bell, we were routed out soon after daylight to catch the "Ocean Limited" north; Bissell, Bean, White and Linder leaving the train at Truro, Long and Pease at Springhill Junction to explore barrens characterized by a scattered growth of *Pinus Banksiana* and *P.*

[1] Wiegand, RHODORA, xiv. 144 (1912).

resinosa, and I going on to Amherst. The two latter areas I had noted from the train on first reaching Nova Scotia, for they were unlike most others which I saw. The chief attraction at Amherst was a series of springy bogs and spring-fed pools by the track southward toward Nappan. In one of these pools I had seen from the speeding train a plant which upon reflection I imagined might be *Montia rivularis*,[1] a European species known in North America only in southeastern Newfoundland and northeastern New Brunswick.[2] Like so many things thus glimpsed from a train, the plant of course was not *Montia* at all, but a mass of half-emersed *Ranunculus Purshii* flecked with stranded fragments of *Lemna minor*. The latter plant, although widely dispersed in southern regions and abundant in pools and streams of eastern New Brunswick, Prince Edward Island, the Magdalen Islands and northern and eastern Nova Scotia, seems to be absent from western Nova Scotia as are the *Ranunculus* and *Lemna trisulca* with which it grew. The spring-pools below Amherst had other good aquatics which we had not seen in the western counties: *Myriophyllum verticillatum*, var. *pectinatum*, *Sagittaria cuneata* Sheldon (*S. arifolia* Nutt.) and, at their margins, swales of *Calamagrostis neglecta* or solid and almost impenetrable stands of the big bullrushes, *Scirpus validus* and *S. acutus*, forma *congestus*,[3] the latter a striking extreme growing apart from typical *S. acutus* and having the spikelets in a single very dense glomerule. The railroad embankment was beautiful with masses of the Harebell, *Campanula rotundifolia*, which we had not seen near Yarmouth, and with it a color-form of Butter-and-eggs, *Linaria vulgaris*, only in this form the corolla, except for the deep-yellow palate, was milk-white.

The sphagnous spruce-bog nearby is a gem, a spring-fed bog with central pond, its quaking margin full of *Carex limosa* and *C. diandra*, species common enough in the region bordering the Gulf of St. Lawrence but not found all summer in southwestern Nova Scotia. The bog was white with *Scirpus hudsonianus* and that rare and elegant cotton grass, *Eriophorum Chamissonis*, forma *albidum*.[4] The con-

[1] See Fernald & Wiegand, Rhodora, xii. 138, t. 84, fig. b (1910).

[2] Blake, Rhodora, xx. 104 (1918).

[3] Scirpus acutus Muhl., forma **congestus** (Farwell), n. comb. *S. occidentaiis*, var. *congestus* Farwell, Mich. Acad. Sci. Ann. Rep. xix. 247 (1917).

[4] Eriophorum Chamissonis C. A. Meyer, forma **albidum** (F. Nylander) n. comb. *E. russeolum*, var. *albidum*, F. Nylander, Acta Soc. Sc. Fenn. iii. (1852) and in Anders. Bot. Not. (1857) 58. *E. russeolum*, var. *candidum* Norman, Ind. Supp. 46 (1864); Hartm. Handb. ed. 11, 450 (1879). *E. Chamissonis*, var. *albidum* Fernald, Rhodora, vii. 84 (1905).

ventional *Arethusa bulbosa*, *Calopogon pulchellus*[1] and *Pogonia ophioglossoides* were abundant; open turfless spots were brilliant with carpets of the deliciously fragrant (pungent) *Utricularia cornuta;* and the drier knolls had *Gaylussacia dumosa*, var. *Bigeloriana;* altogether a bog with most of the plants a bog ought to have and some which are not always found.

"The Chief" or "the Old Man" had assigned the pine barrens about Springhill Junction to Long and Pease because that area is conspicuous for its hopelessly barren aspect and it was certain that if any plant of real interest were isolated there it would be detected by that unequalled pair. But when, returning to Truro for the night, they joined me in the dining-car, they reported that the region was the most sterile area imaginable, not only on account of the limited number of species on the Carboniferous sandstone but because practically all of them had given up trying to produce either flowers or fruit. Besides the two pines they had a few really good things which we had not seen in other silicious areas: *Oryzopsis canadensis* (Poir.) Torr. (*Stipa canadensis* Poir.), known from New Brunswick and Prince Edward Island but not met by us elsewhere in Nova Scotia, and *Carex aenea* and *C. albolutescens*, var. *cumulata* Bailey, afterward found on various sandy barrens. They had found one brook-bottom which had some fertility, yielding the only *Petasites palmata* of the summer; and, while waiting for the train, they had weeded the freight yard and taken away *Linaria minor*, reported in 1907 by C. B. Robinson[2] from Pictou Landing, and now, as it soon proved, a common weed all along the railroad to Halifax and eastward to Cape Breton; the beautiful yellow-flowered *Lathyrus pratensis;* and a strange Crucifer which proves to be *Erysimum parviflorum*, a western species now beginning to move eastward along the railroads[3].

[1] *Calopogon pulchellus* is sometimes called *Limodorum tuberosum* L., Sp. Pl. 950 (1753), but that species rests chiefly upon and draws its specific name directly from "*Helleborine Americana; radice tuberosa*" of Martyn, Hist. Pl. Rar. 50, t. 50 (1728). The Martyn reference is the only one of the Linnean citations showing a plate, a beautiful full-page colored drawing of the plant of the Bahamas treated by Britton & Millspaugh (Bahama Fl. 96) as *Bletia purpurea* (Lam.) DC., although they cite Jacquin's *Limodorum altum*, the description of which definitely cited as a synonym Martyn's *Helleborine Americana; radice tuberosa*. *Limodorum tuberosum* L. is, of course, the earliest name for *Bletia purpurea*.

[2] C. B. Robinson, Bull. Pictou Acad. Sci. Assoc. i. 42 (1907), as *Chaenorrhinum minus* (L.) Lange.

[3] See J. C. Parlin, RHODORA, x. 146 (1908).

The party exploring about Truro had started out as a quartet, following the shores of Salmon River and getting, in some of the pools, *Ranunculus Purshii* and *Myriophyllum alterniflorum*, the latter species seen by us nowhere else during the summer; but they soon divided into pairs, Bean and White working down stream to the extensive reclaimed marshes where they secured a representative collection, but too largely weeds of civilization to require special mention. Bissell and Linder soon found rich, hillside woodlands and thickets and throughout the summer, whenever we were having particularly meagre botanizing, they longingly referred to this hillside at Truro. There they added to our list *Equisetum scirpoides*, *Carex aurea*, *Ranunculus abortivus* and other plants of rich soil not found by us in the silicious country; and for the first time in the summer, though we afterward got it in rich woods or in limy talus at other stations, a very neat little Poa which I had long known as a unique species characteristic of Newfoundland and Prince Edward Island. In its stoloniferous habit the plant resembles *P. pratensis*, but in the very short and stiffly spreading branches of the panicle, its large lance-ovate, acuminate spikelets 5.5–7 mm. long, with very thin and lustrous, strongly 3–5-nerved lemmas, which are conspicuously white-margined, the plant seems to stand well apart. In its technical characters it apparently matches the plate in *Flora Danica* (t. 2402) of *Poa costata* Schumacher,[1] a little known and somewhat problematic plant described from the island of Seiland in the Baltic. In our northeastern coastwise region, Newfoundland, Prince Edward Island and Nova Scotia (fig. 5), the plant is clearly indigenous and its identity with a plant otherwise known only from the Baltic recalls

[1] Poa costata Schumach., Enum. Pl. Saell. i. 28 (1801); Liebm. Fl. Dan. fasc. xli. t. 2402 (1845). *P. pratensis*, var. *depauperata* Liebm., l. c. as syn. (1845). *P. pratensis*, subsp. *costata* (Schumach.) Lange, Nomencl. Fl. Dan. 91, 203 (1887). *P. pratensis*, var. *costata* (Schumach.) Lange, l. c. 329 (1887). *P. angustifolia*, var. *costata* (Schumach.) Richter, Pl. Eur. 87 (1890).—The following American specimens are referred here. Newfoundland: open woods, St. John's, August 4, 1894, *Robinson & Schrenk*, no. 219, in part, distributed as *P. pratensis* and subsequently given an unpublished herbarium-name by Scribner; gravelly fir and spruce woods, Clarenville, August 19 and 20, 1911, *Fernald & Wiegand*, no. 4,630. Prince Edward Island: sphagnous clearings and thickets, Bloomfield, August 7, 1912, *Fernald, Long & St. John*, no. 6,897. Nova Scotia: sphagnous pockets in moist, rich woods and thickets, Truro, July 18, 1920, *Bissell & Linder*, no. 19,995; glades by brookside in mixed woods, southern slope of North Mountain, north of Middleton, July 21, 1920, *Long*, no. 19,996; open woods at base of gypsum cliffs, Port Bevis, August 27, 1920, *Fernald & Long*, no. 19,999.

Polygonum acadiense Fernald, originally described from Nova Scotia but subsequently found to be a characteristic species of the Baltic.[1]

It was close work, after reaching Truro at 9 P. M., to get our collections into papers and be up and ready for a train leaving soon after 6; but we had some good areas noted which required the use of local, early-morning trains. Near Folleigh Lake the Intercolonial (now Canadian National) crosses a high gap in the Cobequid Hills where the traveller is invariably roused to enthusiasm as he looks down the steep slope to the beautiful Wentworth Valley and for several miles notes the unspoiled grandeur of the rich, hardwood forest, one of the few stands of virgin hardwood in the Maritime Provinces. It seemed worth while to get a good sample of the flora of a hardwood mountain-slope, so "the boys," Bean, White and Linder, were detailed to spend the day there. Pease and Long, having spent the preceding day in a hopeless barren, had earned the novel assignment for the day, the calcareous valley of 5-Mile River with its great, fantastic white cliffs of gypsum. To be sure, they had to get up by 5 o'clock and their return train would not get them back until after dark and long after supper-time. But what of that!

Bissell and I were quite happy to try our luck on the shores of Shubenacadie Grand Lake, for somewhere on those 20 miles of shore Mrs. Britton had found growing "among the rhizomes of *Osmunda regalis*,"[2] *Schizaea* and we vaguely hoped that the short time allowed us by the rather unaccommodating train-schedule would suffice to give us a glimpse of the plant *in situ*. As we walked down to the shore from Grand Lake station we found a common New England bullrush, which we had not seen in Nova Scotia, *Scirpus atrovirens*, var. *georgianus*[3] and thickets of Hobble-bush, *Viburnum alnifolium*, and other typical shrubs of the Canadian forest. The shore was composed of slaty and silicious ledges and cobble, where *Xyris caroliniana*, *Rynchospora capitellata* (Michx.) Vahl (*R. glomerata* of the Northern States),[4] *Sisyrinchium gramineum*, and other coastal

[1] See Fernald, Botanisk Tiddskrift, xxxiv. 253 (1916); Ostenfeld, *ibid*, 254; Fernald, Am. Journ. Bot. v. 229 (1918).

[2] Gray, Bot. Gaz. v. 4 (1880).

[3] SCIRPUS ATROVIRENS Muhl., var. **georgianus** (Harper), n. comb. *S. Georgianus* Harper, Bull. Torr. Bot. Cl. xxvii. 331, t. 22 (1900).

Since this was first noted (RHODORA, viii. 163) in 1906 as a common plant of the Northeast, repeated attempts to keep it apart from *S. atrovirens* have shown that it is hardly a species, but rather a fairly pronounced variety.

[4] See Blake, RHODORA, xx. 28 (1918).

plain plants abounded; and after following these ledges for half an hour, each of us with *Schizaea* of the wet bogs in his mind's eye but both stolidly refraining from complaint of the unpromising habitat, dry ledges with their thickets of Low Blueberry, *Vaccinium pennsylvanicum*, Black Huckleberry, *Gaylussacia baccata*, and the Nova Scotian representative of *Amelanchier stolonifera*, with an occasional damp pocket full of *Carex polygama* or *Rhus Toxicodendron*, Bissell finally broke the monotony by firmly asserting that it was foolish to expect *Schizaea pusilla* on dry ledges and that we might as well give it up or hunt for a boggy shore. The latter course seemed preferable, so, remembering a wet shore we had seen from the train, we retraced our steps toward it. Still hoping against hope I was watching every crevice when my eye detected a puzzling Violet. Dropping upon my knees, I carefully inserted my hand-pick into the rock-crevice and dug out the first Violet, and with it *Schizaea*. *Schizaea pusilla* of the bogs here growing in dry rock-crevices! We did not hunt up the boggy shore but picked and chiseled *Schizaea* from the ledges until a violent shower drove us to shelter.

In the shelter of the station we sorted our collections and found that the plant of the gravelly lake-margin, with quill-like leaves closely suggesting those of the Cape Cod *Sagittaria teres*, was really young material of the aquatic plantain, *Littorella americana* Fernald,[1] an extremely rare plant which Mrs. Britton had collected[2] on the shore of Grand Lake in 1879. The milkweed of the wet gravel suggested *Asclepias incarnata*, var. *pulchra*, but it had few, very short leaves (the longest 4.5–6.5 cm. long) glabrous or only minutely and very remotely hirtellous beneath. I had at times imagined that there might be a specific line between *A. incarnata*, with its elongate, essentially glabrous leaves and deeper-colored flowers, and *A. pulchra* Ehrh., with its oblong or elliptic leaves decidedly hairy beneath and its commonly paler flowers; but this Grand Lake material and a similar colony afterward found on Tusket Lake has the leaves even shorter and broader (in proportion) than in *A. pulchra* but as smooth as in *A. incarnata*.

We got back to Truro long before supper and had our collections in papers when the party returned from Folleigh. We had correctly

[1] Rhodora, xx. 62 (1918).

[2] E. G. Knight as reported in Bull. Torr. Bot. Cl. vii. 1 (1880); Gray, Bot. Gaz. v. 4 (1880); E. G. Britton, Linnaean Fern Bull. iv. 17 (1896); all as *L. lacustris*.

interpreted the region, to the extent at least of diagnosing it "rich woods:" *Polystichum Braunii*, *Carex scabrata* (fig. 9), *Habenaria macrophylla* and *H. bracteata*, *Arisaema triphyllum*, var. *Stewardsonii* (Britton) G. T. Stevens,[1] the Canadian representative of the more southern or Alleghenian *A. triphyllum*, *Ranunculus recurvatus*, *Amelanchier Bartramiana* (Tausch) Roemer,[2] *Viburnum alnifolium*, etc.

When, toward 9 o'clock, the 5-Mile River party came in, they were a tired, hungry and rain-soaked pair. They had been out since early morning in the richest spot of the summer and their sneakers and clothes plainly showed the result of a day of enthusiastic exploration of the knife-sharp pinnacles and unyielding talus and crests of gypsum. They had repeatedly emptied their collecting boxes and were loaded down with two rücksacks, a large bundle and two boxes full of specimens and had been forced to quit on account of darkness,—385 specimens of 154 species from a limy district, but not at all the plants of the acid coastal plain such as Bissell and I had got at Grand Lake or which abound in Yarmouth County: *Cystopteris bulbifera* (fig. 6), *Carex eburnea*, *Sphenopholis pallens*, *Amelanchier canadensis*[3] (fig. 8), *Fragaria vesca*, var. *americana* and *Erigeron hyssopifolius* (fig. 7) from the cliffs and talus; *Pteretis nodulosa* (Michx.) Nieuwl.,[4] *Athyrium acrostichoides* (Michx.) Milde,[4] *Milium effusum*, *Festuca nutans*, *Asperella hystrix* (L.) Humb.,[5] *Carex rosea*, *C. retrorsa* and *C. Deweyana*, *Lilium canadense* (fig. 10),

[1] *A. triphyllum*, var. *Stewardsonii* is often very distinct and in its extreme development seems like a good species, but too often transitional forms occur and the plant seems to be best treated as a geographic variety. Bicknell has treated it as "a state or form" of *A. pusillum* (Peck) Nash (Bicknell, Bull. Torr. Bot. Cl. xxxvi. 1) and states that "the evidence appears unmistakable that the two plants are extreme variations of a single species." *A. triphyllum*, var. *pusillum* Peck is a coastal plain extreme extending from Texas to Oklahoma and Florida, thence north to southeastern Massachusetts. Var. *Stewardsonii*, in its best development, occurs from Prince Edward Island to Vermont and Pennsylvania and perhaps to the mountains of Georgia. At least, the material in the Gray Herbarium referred by Dr. Gray to *A. quinata* (Nutt.) Schott (*Arum quinatum* Nutt.), a reputed species described from Georgia as distinguished from *A. triphyllum* by its "Leaves quinate, lanceolate, acuminate," shows leaves bright green below as in var. *Stewardsonii* and varying on the same plant from ternate to quinate, and the slope of the recurved flange at base of the hood exactly as in the northern var. *Stewardsonii*. In var. *Stewardsonii* of New England the leaves, although normally ternate (as are the majority of leaves of "*A. quinata*"), are sometimes quinate or with the lateral leaflets deeply parted.

[2] See Wiegand, RHODORA, xiv. 158 (1912).

[3] As interpreted by Wiegand, RHODORA, xiv. 150 (1912).

[4] See Weatherby, RHODORA, xxi. 178 (1919).

[5] See Hubbard, RHODORA, xiv. 187 (1912).

Listera convallarioides, *Ostrya virginiana*, *Laportea canadensis*, *Dentaria diphylla*, *Geum canadense*, *virginianum* and *strictum*, *Circaea latifolia* Hill,[1] *C. canadensis* Hill,[2] *Sanicula gregaria*, and *Viburnum Opulus*, var. *americanum* from the alluvial or other rich woods; and *Sagittaria cuneata* Sheldon (*S. arifolia* Nutt.), *Carex riparia*, var. *lacustris* (Willd.) Kükenthal and *Nymphozanthus rubrodiscus* (Morong) Fernald[3] from the pools.

Only the impossibility of properly preserving such a bulk of choice specimens without driers and presses and the insistent demands of our schedule could drag us at once away from a region so full of interesting spots, and this in spite of the hotel at which we were lodging. We were told that if we went to one of the hotels we should wish we had gone to the other, so we went to the other. Afterward, while visiting friends at Baddeck, we were told of one of their recently departed guests who had wired back, much to the bewilderment of the Gaelic telegraph-operator: "Spent a week this morning in Truro!" They could not tell us where he breakfasted.

Starting, by express, to Yarmouth our many bundles of specimens, already laid out in white paper but without driers, we ourselves went on the morning of July 20 to Middleton in the Annapolis Valley, a fascinating trip with its diversity of landscape: the great reclaimed marshes west of Truro; the ragged, white gypsum cliffs in the woods which Pease and Long pointed out to us, and others near Windsor; the great red-mud canons, deep down in the bottoms of which meandered at low tide tiny streams soon to be changed by the Fundy tides to broad and deep brick-red rivers; the great hayfields with the monument to Evangeline at Grand Pré and beyond them Blomidon capped with cloud; the miles and miles of apple and peach orchard closely cultivated and putting to shame our neglected New England orchards of rock-pastures and otherwise useless spots. Near Berwick and from there to Wilmot were vast uncultivated plains carpeted, wherever dry enough, with a close growth of the New Jersey pine barren *Corema Conradii*, and, although these barrens were the finest we saw, we had to content ourselves with small and unspoiled remnants of them at Middleton. Unspoiled, because, although these *Corema* heaths are forbidding enough in appearance and at the sur-

[1] See Fernald, Rhodora, xvii. 222 (1915).
[2] See Fernald, Rhodora, xix. 87 (1917).
[3] Rhodora, xxi. 187 (1919).

face are highly acid and barren, when deeply plowed and cultivated they are transformed into the great orchards for which "the Valley" is everywhere famed.

The *Corema* plains at Middleton, if a fair sample, as they doubtless are, indicate that the vast stretches of such country farther east will yield interesting results. "All hands" browsed over these plains during the afternoon and, although we became scattered, Long, Pease and I eventually found ourselves within hailing distance and our observations will suffice for the party. The drier places, where *Corema* is dominant, had dewberries, mostly *Rubus arenicola* Blanchard, one of the characteristic trailers of Cape Cod and of York County, Maine, and the sand-barren *Viola fimbriatula*, *Lechea intermedia*, *Potentilla tridentata*, which abounds among the dunes at Provincetown and elsewhere near the tip of Cape Cod, and endless variations of *Vaccinium pennsylvanicum*, both the forms with yellow-green foliage and those with glaucous leaves, the series of variants called var. *nigrum*. A singular form of the glabrous variety of *Panicum depauperatum* was abundant, always with the inflorescences hidden at the base of the plant, and only when wandering into disturbed railroad-gravel or cultivated land assuming its ordinary appearance, with well-developed panicles on elongate culms. In the damper *Polytrichum*-carpeted areas *Sisyrinchium arenicola* (see p. 96) was found, and such places were characterized by *Carex atlantica*, *C. foenea*, var. *perplexa*, *C. albolutescens*, var. *cumulata*, and, more abundant than any, a sterile *Carex*, seeming to be a hybrid of the latter and the ubiquitous *C. scoparia*. *Bartonia virginica* was everywhere and the lustrous-leaved *Amelanchier stolonifera* abounded, though sadly denuded by some caterpillar, and *Pyrola rotundifolia*, var. *arenaria* was there, though scarce.

In 1910, the late Dr. E. L. Greene, apparently making a change of trains at Middleton (a junction point), collected a purple Gerardia (now correctly known as *Agalinis*) and described it as *Gerardia neoscotica*. One of our reasons for stopping off at Middleton was to search for the type station for this northeastern representative of a southern genus and to secure good material. The search did not involve great difficulty for, in following a cartroad, Bissell and Linder promptly came upon Greene's original spot (clearly indicated in the original description) and collected material. By the time they got it back to the hotel most of the corollas were gone, so before break-

fast next morning Linder conducted me to the spot where we laid a good supply of freshly flowering specimens into folds of paper and he secured a good portrait of the growing plant. Subsequently, to be sure, the species proved to be ubiquitous in western Nova Scotia so that we got it in all stages of development, even to the large bushy-branched plants 3.5 dm. high with mature fruit, but it was gratifying to have a series from the type station. Dr. Harold St. John also collected the plant on Sable Island in 1913 so that it will doubtless prove to be generally distributed in the silicious areas of the province. Our collections embrace 25 numbers and the characters originaly pointed out by Greene are amazingly constant: the broadish rather fleshy leaves (which do not quickly curl as do the linear-attentuate leaves of *Agalinis paupercula*); the very long and foliaceous scabrous-serrulate calyx-lobes and the almost tubular little corolla with only slightly spreading lobes. To Greene's statement of characters should be added the facts that the mature capsule is shorter than to barely equalling the calyx, and that the mature calyx-lobes tend to become divergent. The corollas have no yellow lines in the tube, but whether this character is diagnostic can be determined only by further observation of fresh material of *A. paupercula*. Altogether the plant seems to be a clearly marked species.[1]

On July 21 we had the first break in our party and one which we keenly felt, for every one who knows Stanley Pease, his quick wit and kindly humor, will appreciate the loss we felt when he took the first train to Digby, thence to return to "the States." He and I spent a short morning, until his train left, on the plains about Middleton, collecting better material of some of the specialties but adding little of importance to the discoveries of the day before. Bissell, Bean, White and Linder drove across the North Mountain to the shore of the Bay of Fundy at Margaretville, bringing back such well-known plants of this basaltic coast as *Iris setosa*, var. *canadensis*, *Primula farinosa*, var. *macropoda* and *Euphrasia purpurea*, var. *Randii*. Long spent an exasperatingly short hour testing the rich woods and swales on the southern slope of the basaltic North Mountain, just glimpse enough for him to yearn all summer for another and extended visit to the slope where he had collected *Equisetum scirpoides*, *Poa costata*,

[1] AGALINIS **neoscotica** (Greene), n. comb. *Gerardia neoscotica* Greene, Leaflets, ii. 106 (1910). *A. paupercula* (Gray) Britton, var. *neoscotica* (Greene) Pennell & St. John, Proc. Bost. Soc. Nat. Hist. xxxvi. 93 (1921).

Carex scabrata, Juncus Dudleyi, Trillium erectum, Corallorhiza maculata, Dentaria diphylla, Geranium Robertianum and *Osmorhiza divaricata*, the latter a northern species new to the western counties but previously found by Nichols in Cape Breton and afterward collected also by Long and me about gypsum talus in Cape Breton.

We reached Yarmouth that evening and the next three days were occupied until late in the evenings with our presses. The 5000 driers proved wholly inadequate, for Yarmouth was wrapped in its conventional blanket of fog and sun-drying was out of the question. We had already been driven to various expedients to meet the penetrating dampness and now with great regularity, as soon as corrugated ventilators had been inserted, the presses were stacked high in a square about the kerosene stove or suspended over it from the rafters. The wet driers for immediate use had to be "toasted" while such as could be allowed a more prolonged aeration were tucked end-on into chinks in the rough boarding of the empty hay-loft. The act of thus fitting the rough ends of the driers into shallow chinks from which they drooped soon became a real art and with the aid of a ladder we were eventually able thus to decorate the rough sloping walls of the loft with nearly 2000 driers at one turn.

The 23rd was for us an unfortunate day, for Bissell felt that he must get home but he had had a taste of Nova Scotia botanizing and the leaven continued to work after he got back to Connecticut; for later in the summer he took another vacation and one morning appeared ready for work just as we were going down to breakfast.

On the afternoon of the 24th there was time for a short half-day's collecting so the amended party, Long, Bean, White, Linder and I went after the weeds of the docks, railroad yards and waste heaps of Yarmouth. We scattered in different directions and the more interesting weeds of the day included typical *Sisymbrium officinale*, apparently commoner in Nova Scotia than var. *leiocarpum*, *Coronopus didymus, Lepidium Draba, Iberis amara* L. and *Carduus acanthoides*.

Next day, July 25, we were ready for field work and since, on the earlier visit, we had had only a glimpse of either Beaver Lake or Cedar Lake, we went there; Long and Linder stopping off for the day at Beaver Lake; Bean, White and I going on to Cedar Lake. Many of the plants of July 11th were now in splendid condition, the cespitose and nearly beardless *Pogonia ophioglossoides* forming extensive colonies with well-formed fruit, and, abundantly intermixed with it

in the cobble-beach, *Ophioglossum vulgatum*, so closely similar that it required real care to separate the two; and even after the plants were in press we found roots of *Ophioglossum* tangled with those of the *Pogonia*. *Panicum spretum* had developed wonderfully and now formed a handsome and almost continuous belt at the upper border of the beach, and in the cobble-beach with the *Pogonia*, *Ophioglossum* and *Liparis Loeselii* there was the usual series of intergrades between typical *Botrychium dissectum* and the var. *obliquum*.

In the inundated peaty border of Beaver Lake, Long and Linder were getting *Utricularia minor* and, in fine flower, the common but rarely flowering *U. intermedia*, and near by a beautiful tall *Panicum*, in habit resembling *P. spretum* but with broad panicle and very ciliate sheaths and densely bearded nodes, one of the complex of plants which is treated by Hitchcock & Chase as many species: *P. Lindheimeri*, *P. huachucae*, *P. tennesseense*, *P. languidum*, etc., but this plant is nearer the type-material from Texas of *P. Lindheimeri* than to the others. In sending to a contributor to Rhodora a galley proof in which *Panicum* was mentioned the editor once made the penciled query opposite one expression: "Redundant?" The proof came back without change except for the added comment: "The spikelets of all the Panicums are redundant." Be that as it may, it is certain that many of the species of *Panicum* as recognized at present in America are highly redundant. The four above mentioned are clearly phases of one species but I am not yet certain that there are not still more of their variants similarly masquerading as species. At the margin of the lake they found the unique *Myriophyllum tenellum*, and when, returning from Cedar Lake, we stopped to take them in, Long was a half-mile away on the barrier beach below the mouth of Beaver River, whence he returned with *Carex silicea*, the characteristic whitish-brown sedge of our southern dunes.

Our botanizing had developed a pendulum-swing, first north then south, so on the 27th, as it was the turn to work south, we went to Belleville station, Long and Linder working eastward to explore some of the lakes in that direction, Bean, White and I going west around the shore of Eel Lake and on to Abram River. Eel Lake is decidedly brackish, where we examined it full of *Potamogeton pectinatus* and *Ruppia maritima*, var. *longipes* Hagström,[1] which is abund-

[1] See Rhodora, xvi. 125 (1914).

ant in maritime pools southward quite to tropical America. The rocky shore, too, had maritime plants: *Samolus floribundus* in wet crevices, *Teucrium canadense*, var. *littorale*, and *Juncus articulatus*, var. *obtusatus*. West of Eel Lake we came to an extensive, dry, *Polytrichum*-covered barren with meagre enough vegetation but with *Habenaria blephariglottis* and *Ilex glabra* abundant, even dominant in some areas, *Carex aenea*, which we had had only from Springhill Junction, and a good number of Panicums. The brackish marshes along Abram River contained extenisve sloughs full of *Scirpus Olneyi*, which, when we first got it at Sand Beach, had seemed a thrilling discovery; a small quagmire at the border of the barren was full of *Utricularia geminiscapa* Benj. (*U. clandestina*); and a wet cart-road was bordered by *Juncus acuminatus* and *J. marginatus* (one of the long discredited plants of Lindsay's *Catalogue*).

When we returned to Belleville station Long was closely studying the railroad-bed—to find more of the curious little weed with short, club-shaped scapes and tiny dandelion-like heads, *Arnoseris pusilla*. The plant, a wanderer from Europe, is well established at this point and is likely to spread, since no one bent on gathering a bouquet will disturb it. Long and Linder had got into dry barrens where *Corema* abounds but most of the lakes had hopelessly inaccessible shores, flooded high into the bushes and bordering swales where, floundering through the acres of *Sparganium americanum* or *Pontederia* one would take his life in his hands (or more likely consign it to the waters). They had succeeded, however, in finding enough accessible shore at Clearwater Lake and at another, called Minnigobake, to secure *Cyperus dentatus*, which we had not previously collected, *Ophioglossum vulgatum*, occurring in cobble-beach as at Cedar Lake, *Myriophyllum tenellum* and *Subularia aquatica* again and, of course, *Utricularia subulata*. The most striking discovery, however, was that of *Juncus subcaudatus* (Engelm.) Coville & Blake,[1] in the wet border of a spruce swamp. This plant, treated in the 7th edition of the Manual as a southern variety of *J. canadensis* (ranging north to Rhode Island, although Long and I have subsequently got it on Cape Cod), we found through the rest of the season to be a thoroughly characteristic denizen of boggy woods or openings in spruce swamps from Digby Neck south through Yarmouth County, thence

[1] Coville & Blake, Proc. Biol. Soc. Wash. xxxi. 45 (1918).

east to Queens County; but, although clearly belonging with *J. subcaudatus*, the Nova Scotian plant differs in having a shorter perianth with broader and greener uncorrugated sepals and thus constitutes an endemic Nova Scotian variety.

There is a little sand- and cobble-bordered lake by the railroad about a mile south of Lake Annis. We had more than once specially noted it as a promising spot, consequently on July 29, Bean, White and Linder went there to try their luck. They soon learned that this is Jassy Lake and if we had not begun to be satiated with *Utricularia subulata, Subularia aquatica* and *Myriophyllum tenellum*, would rank as a good spot. They brought back *Solidago canadensis*, which sounds uninteresting, but singularly enough, during the whole summer we did not see this characteristic Canadian species in southern Yarmouth County nor in Shelburne and Queens Counties, its place in swampy thickets being there preempted by another plant not yet in flower but decidedly not *S. canadensis*. They also had a very delicate *Utricularia*, the material all sterile but in the capillary forking of its leaves and in its bladders closely matching *U. gibba*.

The glimpse of Trefry's Lake which Pease and I had got two weeks earlier had stayed vividly in my mind throughout that crowded and ever-changing fortnight and Long was not averse to visiting its shores, so, while the others were at Jassy Lake, he and I spent one of the happiest days of the summer, making an almost complete circuit of the lake. The vegetation had greatly changed in two weeks and, owing to frequent rains and prolonged fog, the narrow beach had become almost invisible. As we started in we came upon *Sieglingia decumbens* in the most *natural* spot of the summer, at the upper border of the beach next the thicket, but there was a cow-path nearby so that here as elsewhere the evidence of its native character was inconclusive.

The very distinct goldenrod of the subgenus *Euthamia*, which we had been watching at other lakes, was now in good condition in the shallow water, though the plants higher on the beach were not yet flowering; a beautiful little plant with tall, simple stems rarely branching at the summit and with very fleshy and firm, dark-green mostly 1-nerved, linear-oblong to linear-lanceolate, blunt or merely acute, erect leaves, and with the deep-yellow heads so densely crowded as to make the corymb appear like a handsome golden button commonly only 1 or 2 cm. in diameter, or in extreme plants like a few

crowded buttons. This plant was seen or collected throughout Yarmouth County and eastward in the silicious belt as far as Queens, everywhere dominant and thoroughly characteristic of these sandy and cobbly lake-margins. Close study, however, fails to reveal any specific characters in the heads by which the Nova Scotia plant can be constantly distinguished from the coastal plain *Solidago tenuifolia* and it is, consequently, here treated as a pronounced geographic variety of the southern *S. tenuifolia.*

We had been closely watching *Utricularia cornuta* for, when the plants were still young and before the corollas expanded, we had noticed that in some colonies the flowers were approximate at the summit of the stem as good *U. cornuta* is supposed to have them, while in other colonies or often in the same colony were plants with the flowers scattered along the upper part of the stem, a character which, with its smaller flowers, is supposed to distinguish *U. juncea* of South America, the West Indies and the southern coastal plain. *U. cornuta* was at last in prime condition and here, on the beach of Trefry's Lake, were many plants with flowers as small as in the smallest-flowered *U. juncea*, but closely approximate; while at neighboring lakes we found colonies with flowers larger than we had ever before seen in *U. cornuta* but as remote as in *U. juncea*. *U. juncea* is said to have a less spreading margin to the lower lip but if this character proves no better than the others ascribed to it, it will be evident that, when in 1847 Benjamin[1] treated the two as one species, he was not far from the truth.

Slightly beyond the *Smilax* tangle where Pease and I had turned back there was a second mass of Cat Brier, only this was *S. rotundifolia*, var. *quadrangularis*, a coastal plain variety previously known northward to Nantucket and Cape Cod. The name *quadrangularis* is most unfortunate, since the finer branches and branchlets of typical *S. rotundifolia* are as often as not quadrangular, the distinctive feature of the variety being its ciliate leaf.[2] While Long was gathering specimens of the *Smilax*, I was absorbed in contemplation of the golden-rod growing at the border of the spruce swamp, still immature but surely *Solidago Elliottii*, a thoroughly distinctive species, originally from Carolina and Georgia, named for Stephen Elliott, the great botanist of South Carolina, and "rare and local" even in south-

[1] Benj. Linnaea, xx. 305 (1847).
[2] See Bicknell, Bull. Torr. Bot. Cl. xxxvi. 10 (1909).

ern New Jersey; and north of the Cape Cod region so extremely rare that its single station on the Neponset meadows, south of Boston, has long been a famous spot. I was also worried by a shrub with lustrous dark-green leaves which looked amazingly like some Azalea, but close examination showed that the Nova Scotian shrub was an extreme form of Rhodora, *Rhododendron canadense* (L.) Torr., forma *viridifolium* Fernald,[1] quite lacking the grayish bloom which usually characterizes the foliage and new twigs of that shrub. At the northern end of the lake is a deep sluggish creek of indefinite depth, blackness and breadth which could be crossed only by finding a rare leaning tree or log; and during the hunt for such a bridge we struggled through a dense tangle of *Rosa palustris* and *Smilax rotundifolia*, southern types now losing their novelty and later on found to be frequent species, the *Smilax* seen northward to the banks of Sissiboo River in Digby County and eastward to the banks of Sable River in eastern Shelburne County.

In this thicket grew the characteristic coastal plain variety of *Juncus effusus*, the plant with slender purple sheaths, pliant and conspicuously corrugated culms, as in vars. *conglomeratus* and *Pylaei*, but with perianths intermediate between those of the other two varieties. This plant is general on the coastal plain from South Carolina to southern Maine and in Nova Scotia. West of the creek for some distance the spruce and red maple swamp was so extremely palpitating at the border of the lake that we were forced some distance back through the everywhere dominant Inkberry and Chain Fern, the monotony occasionally relieved by *Calla palustris*, which seems to be rare in southwestern Nova Scotia. One of the coves at this side of the lake had, far out in deep water, a broad belt of some aquatic *Sparganium*, and we made frequent attempts along the quaking margin to find stranded fragments. Failing in this and coming to surer footing, we waded out as far as possible and with the aid of a small tree succeeded in dragging in a tangle from the *Sparganium*-belt, the northern *S. fluctuans*, ranging from Quebec to northern Connecticut and Minnesota, and with it a mixture of the coastal plain *Utricularia purpurea* and sterile fragments of the characteristic New Jersey pine barren *Potamogeton confervoides*, a species also common in eastern Newfoundland but not heretofore known from Nova Scotia.

[1] Fernald in Wilson & Rehder, Mon. Azal. 122 (1921).

The evening train into Yarmouth whistled a couple of hours before we had completed the circuit of Trefry's Lake, but so keen were our interest and enjoyment, that last trains were not to be considered, and when we finally got back to our starting point a seven-mile road-walk was between us and Yarmouth. There were a few remnants left from lunch and, after passing the village of Arcadia, we left the dusty road and enjoyed our simple arcadian meal while closely scrutinized by the cattle of a roadside pasture.

Next day, we were more than crowded in putting up our specimens and overhauling the presses and at night we lost Bean, who was obliged to return home.

The map indicated some small ponds not far west of Hectanooga station and, consequently, on July 31, Long and Linder tried to find them, but not even the oldest inhabitant, whose acquaintance they promptly made, knew of any such ponds and they were forced to content themselves with Hectanooga Lake and the very unsatisfying Little Doucette Lake. These lakes, although not up to our somewhat exacting standard, furnished a few good things: the largest *Isoetes* of the summer, with bulbous base 4.5 cm. in diameter, the coastal plain *Potamogeton Oakesianus* which we had not had, *Najas flexilis*, also the first of the season, and one of the representatives of the complex group passing as *Sagittaria graminea;* and in the woods, which they reported as rich and unspoiled, were *Agrimonia gryposepala*, the northern *Pyrola secunda*, var. *obtusata*, and other plants indicating essentially virgin forest.

White and I, at the same time, had drawn a more prolific area, Salmon or Greenville Lake, where the reconnoitering party of the 13th had found *Galium tinctorium*. We left the car at the southwest corner of the lake and made our way across a boggy pasture to the shore. At the point where we reached the lake a cold brook enters and in it grows a splendid clump of the tall, perennial smartweed described by Small as *Polygonum punctatum*, var. *robustior*, a handsome plant ranging northward from South America but heretofore unknown east of Massachusetts. Subsequently, however, we found it at other stations in Yarmouth County (fig 13) always characteristic and here as from Massachusetts to South America constantly differing from *P. acre* (or *P. punctatum*) in its very stout stems; strong, perennial, woody rootstock with coarse basal offshoots; more approxi-

mate and more truncated ocreolae; long-exserted fruiting pedicels; larger, always trigonous, achenes with concave faces; and distinctly later flowering season. The plant seems to be a perfectly definite species which should be called *Polygonum robustius*.[1] The shore was inviting in both directions, up the west side of the lake or around the southern end, and as a decision had to be made we chose the southern end. *Polypodium vulgare*, here having no rocks to grow on, was climbing the tree-trunks, the creeping rootstocks ascending in the crevices of the bark to a height of 2 or 3 meters. *Rosa palustris* and *Smilax rotundifolia*, with the variety *quadrangularis*, soon proved to be common, as were *Apios tuberosa* and *Woodwardia virginica*, but here the Chain Fern was growing in the cobbly beach of the lake. One of the Joe Pye Weeds was also frequent at the upper border of the beach; not, however, the widely dispersed Canadian species, the plant treated by Wiegand[2] as *Eupatorium maculatum* L. and by Mackenzie[3] as *E. Bruneri* Gray, but, as we might have predicted, the coastal plain plant, heretofore known from South Carolina to southern New Hampshire, *E. verticillatum* of Wiegand's treatment or *E. purpureum* of Mackenzie's. All the *Sisyrinchium gramineum*, an abundant plant in the cobbly shore, had quite simple scapes, thus simulating *S. angustifolium*, but its paler bluish flowers and its fruits were clearly those of *S. gramineum*. The plant, however, which most interested us, was an abundant *Habenaria* of the cobbly beach. In aspect strongly suggesting the frequent *H. flava* of the northern states, this plant differed in its very attenuate and narrow leaves chiefly borne toward the base, so that the flowering stem was subscapose, and in its extremely slender and open raceme of small greenish flowers with very short bracts. Subsequently the plant was found at various stations in the Tusket Valley, differing strikingly from the plant which passes as *H. flava* in New England and thence west to Minnesota and Missouri, south in the uplands to the Carolina Mountains; the latter plant having the broader, more elliptic and less attenuate leaves running higher up the stem and the raceme more compact and usually with much longer bracts. Detailed

[1] Polygonum **robustius** (Small), n. comb. *P. punctatum robustior*[*us*] Small, Bull. Torr. Bot. Cl. xxi. 477 (1894). *Persicaria robustior* (Small) Bicknell, Bull. Torr. Bot Cl. xxxvi. 455 (1909).

[2] Wiegand, Rhodora, xxii. 64 (1920).

[3] Mackenzie, Rhodora, xxii. 165 (1920).

study shows that the plant of Yarmouth County is true *H. flava* (*Orchis flava* L.),[1] a species which in its typical form occurs on the coastal plain from Texas to Florida and New Jersey, the more inland plant being *H. flava*, var. *virescens*.[2]

We were in the midst of an exceptionally prolonged Yarmouth fog, and it was not until August 4th that we had a sufficient quantity of "toasted" driers to carry the accumulated collections safely through press. On that day, however, all four of us made excursions into the edge of the barrens in the eastern section of Argyle; Long and Linder trying the area near Argyle Head, White and I going on to the extensive barren between Lower Argyle and Goose Lake.

After passing through ordinary spruce woods, White and I came upon the dryish sphagnous border of the barren, at this season dominated by Bakeapple, *Rubus Chamaemorus*, which had not fruited well, *Carex oligosperma*, *Gaylussacia dumosa*, var. *Bigeloviana*, *Empetrum nigrum*, *Ilex glabra*, and *Calamagrostis Pickeringii*, var. *debilis*, with *Habenaria blephariglottis* scattered everywhere. Toward the wet center of the boggy barren there is a series of shallow pools, where in spring a considerable stream must flow. The borders of these pools are marked by the most spectacular growth of Pitcher Plant, *Sarracenia purpurea*, we had ever seen, while the open mucky spots were brilliant with solid carpets of *Utricularia cornuta;* and the pools themselves were often filled with the coastal plain *Scirpus subterminalis* and *Potamogeton Oakesianus*. East of the central pools the barren becomes very dry, carpeted with *Cladonia rangiferina*, *Corema Conradii*, *Empetrum*, *Scirpus cespitosus*, var. *callosus* and other such plants of dry heaths; and it was while here collecting *Bartonia virginica* and that puzzling little *Melampyrum* of northern bogs, that we came upon *Schizaea pusilla*, this time growing in hollows of the *Cladonia* carpet.

Goose Lake itself proved very uninteresting, bushed close down to the bouldery shore, so that we started back toward the railroad by a new route and quickly found ourselves in an extensive quagmire, where the particularly interesting plant was *Xyris montana*,

[1] "The specimens in the Linnaean and Gronovian herbaria are comparable to the specimens with elongated racemes frequently found in the South and Southwest"—Ames, Orchid. iv. 45 (1910).

[2] *Habenaria flava* (L.) Spreng., var. **virescens** (Muhl.), n. comb. *Orchis virescens* Muhl. ex Willd., Sp. Pl., iv. 37 (1805). *O. flava*, var. *virescens* Green, Cat. Pl. N. Y. 60 (1814).

here in greatest profusion and forming in the wettest hollows an almost continuous carpet. In collecting sods of this northern representative of an austral genus we constantly found our hands filled with loose needle-like flowering and fruiting scapes, for in this species, it appeared, the scapes are unique in freely disarticulating at the very base, all our other species of *Xyris* firmly holding their fruiting scapes through the winter. At the western border of the barren we noticed a particularly wet quagmire and, although we had only a few minutes to train-time, we were so strongly tempted to take a peep that we ventured into the slough,—*Schizaea* everywhere, here in the wettest of moss- and liverwort-carpets, two Bartonias, one of them suggesting the Newfoundland *B. iodandra*, the other obviously neither that nor *B. virginica* of the drier barren, and *Arethusa bulbosa* abundantly fruiting. Here was a case of the luck we all have experienced, —the discovery of a choice spot on the way home—but there was nothing to do but to make mental note of it as a place which needed further exploration.

A few miles to the north, about Argyle Head, Long and Linder had also been collecting Bartonias and *Xyris montana*, but their other specialties were different from ours: *Juncus subcaudatus, J. marginatus, Eleocharis rostellata, Polygonum robustius* and the tree-climbing *Polypodium* again; and some good things we had not previously had, *Woodwardia areolata* and *Rhexia virginica* on the bushy shore of Randel Lake, the *Woodwardia* not heretofore definitely known east of southern New Hampshire, *Hypericum dissimulatum*[1] described by Bicknell from York County, Maine, Nantucket, Martha's Vineyard, Long Island and southward, *Rynchospora capitellata*, var. *discutiens* (Clarke) Blake,[2] which Long and I had found the preceding year on Cape Cod but otherwise unknown except in North Carolina and as a member of the famous, isolated coastal plain flora of northern Indiana, the southern *Eleocharis Robbinsii*, and, in good fruit, *Potamogeton confervoides* and, to add a northern flavor, *Euphrasia canadensis* Townsend,[3] a characteristic species occurring from the Gulf of St. Lawrence to the foothills of the White Mountains.

On August 6, White followed the too prevalent fashion and returned home, leaving Long, Linder and me to carry on the work. On the

[1] Bicknell, Bull. Torr. Bot. Cl., xl. 610 (1913).
[2] Blake, Rhodora, xx. 28 (1918).
[3] See Fernald & Wiegand, Rhodora, xvii. 195 (1915).

trip to Halifax we had noted along the bay south of Barrington some very attractive white sand hills and, since the nearest approach to such a habitat we had yet explored was the barrier beaches, we started on the morning of August 7 for Barrington. The train, as usual, was crowded and I found myself sharing a seat with a most interesting companion, Mr. John Kelly, Superintendent of the Lighthouses of western Nova Scotia and the Bay of Fundy. Mr. Kelly greatly relieved my mind by assuring me that the period of fog, which was still at its height and which had already lasted without interruption for more than 300 hours, was in reality abnormally protracted, most summer fogs of western Nova Scotia lasting less than 100 hours without at least a few hours of sunshine. From Barrington we were driven to Villagedale where the best dunes are situated, great white dunes invading the forest and in the rolling fog marvelously spectacular and magnified. As usual, there were broad flats among the hills, but *Xyris montana* of the quagmires seemed strangely out of place in such a habitat. *Limosella subulata*, *Sagina nodosa* and *Polygonum Raii* Bab.[1] were there, as we had hoped, and so was the always interesting *Tillaea aquatica*. *Juncus bufonius*, luxuriating in the brackish sand, had amazingly large flowers (sepals up to 9 mm. long) but *Viola primulifolia*, wandering in from the acid areas, was fruiting though its leaves were less than 1 cm. in length. *Juncus Greenei*, the commonest species on Cape Cod, and formerly known eastward only to Mt. Desert Island, was abundant with *Carex silicea*.

Returning to Barrington on Monday, the 9th, we drove eastward to Clement Pond. Three weeks earlier this pond had been most attractive from the train, with a well exposed beach, but now, after weeks of wet weather the beach was deeply submerged and travel was difficult. At the southeast corner of the pond (just why this large body of fresh water should be called a *pond*, while thousands of others like it are *lakes* we were unable to make out) the shore is a quaking bog, with characteristic growth of *Woodwardia virginica* and *Decodon verticillatus*, var. *laevigatus*, T. & G.[2], the latter heretofore unknown east of the lower Penobscot. In the drier *Polytrichum*-covered border of this bog *Carex albolutescens*, var. *cumulata* and *C. bullata*, var. *Greenei* were abundant and, in many areas, *Corema Conradii*.

[1] See Fernald, RHODORA, XV. 72 (1913).
[2] See RHODORA, XIX. 154 (1917).

The bottom of the lake had a fine development of *Subularia aquatica* but the most amazing sight of the day was the acres and acres of the southern *Solidago Elliottii*, forming solid thickets nearly 2 m. high in the spruce and red maple (often *Acer rubrum*, var. *tridens*) swamp. It was, indeed, a strange experience and one we should hardly expect even in the southern coastal plain, to break our way through the tall stems of this southern goldenrod, much as we had sometimes done on Maine bottomlands through the overtopping masses of Ostrich Fern. When reporting the seeming absence (p. 143) of the characteristically Canadian goldenrod, *Solidago canadensis*, from much of southwestern Nova Scotia, reference was made to an immature plant which there takes its place. This, needless to say, is *S. Elliottii*, which from mid-August through September colors the spruce swamps and boggy clearings. Occasionally, too, in the Barrington swamp there were clumps of *Solidago rugosa*, var. *sphagnophila*, described from southeastern Connecticut, but now known to be common in southeastern Massachusetts and south to New Jersey.

The next morning, most happily, brought Dr. and Mrs. Graves and with them the news that, although he had been unable to get passage on the boat with them, Bissell would be back next morning; and after getting the presses in order, we started out for a short afternoon walk, Long and Linder going to Sand Beach where they got *Polygonum allocarpum* Blake,[1] and found that the *Elymus virginicus* of the barrier beach was all var. *hirsutiglumis*. Dr. and Mrs. Graves and I followed the railroad southeast beyond Yarmouth, getting into such masses of *Habenaria psycodes* as we had never imagined, thousands of brilliant plumes almost crowding each other in the boggy swales. *Botrychium dissectum* and var. *obliquum* were very abundant and here, as elsewhere in Nova Scotia and the eastern states, show such a connecting series as clearly to indicate that they are mere forms of the same plant, and since the name *B. dissectum* Spreng. has priority of six years over *B. obliquum* Muhl. it is necessary to call the latter *B. dissectum*, forma *obliquum*.[2] *Sieglingia* abounded

[1] Rhodora, xix. 234 (1917).

[2] Botrychium dissectum Spreng., forma **obliquum** (Muhl.). n. comb. *B,. obliquum* Muhl. in Willd., Sp. Pl. v. 63 (1810.)

in the dryish swales and we strongly felt that it here *looked* indigenous; and the most abundant rush of these swales was a plant entirely sterile and afterward seen in similar profusion south to Argyle and north to Digby Neck. Everywhere the plant fails to set fruit and the best we can do with it is to suppose it a hybrid of *J. articulatus* and *J. brevicaudatus*, both of which abound in the region.

(To be continued.)

THE GRAY HERBARIUM EXPEDITION TO NOVA SCOTIA

1920.

M. L. Fernald.

(*Continued from p. 152.*)

Luckily Bissell's boat got in promptly, although so baffled by the dense fog (now rapidly approaching the 400-hour mark) that she had difficulty in making the landing. Bissell had barely time to change his clothes before it was time to start for Lower Argyle, for I was anxious to get back to the quagmire White and I had been forced to leave only partly explored, and the others were ready to visit this particularly accessible station for *Schizaea*. The quagmire kept us busy most of the forenoon, chiefly with the collection and study of the amazingly abundant and perplexing representatives of the coastal plain genus *Bartonia*. The genus was now at the height of flowering and for the next two weeks we diligently and unintelligently collected these plants wherever we went. As currently recognized, *Bartonia* consists of four species: the strictly southern *B. verna*, apparently unique and ranging from Louisiana to southern Virginia; *B. virginica*, which seems to be a well-behaved and constant plant, ranging northeastward to the drier barrens of Nova Scotia; *B. paniculata*, extending from Louisiana and Florida to York County, Maine; and the endemic Newfoundland *B. iodandra*. Our constant embarrassment was regarding the two latter. The typical southern *B. paniculata* is a yellowish-green plant with the flowers in compound, thyrsoid inflorescences; with firm and subulate, yellowish leaves and calyx-lobes, the calyx cleft to the base; the corolla-lobes translucent to creamy-white and the anthers yellow. In the New-

foundland *B. iodandra*, on the other hand, the plant is purple-tinged and bears a simple or subsimple raceme with elongate pedicels; the blunt leaves are oblong or ovate and fleshy; the calyx is cleft only two-thirds or three-fourths to the base into herbaceous, oblong or ovate lobes; the corolla is decidedly petaloid and its white or purplish lobes much longer than in *B. paniculata*, and the anthers are usually purple. Unfortunately, however, wherever in Nova Scotia we found the typical southern *B. paniculata*, it was usually, if not always, associated with a coarser plant with simpler inflorescences, purplish color, larger corolla and purple anthers, in these characters closely approaching *B. iodandra* of Newfoundland. In Nova Scotia the two plants so freely intergrade that it is most difficult to draw a sharp line between them. The trouble is not a new one. In 1894 the late Dr. Geo. G. Kennedy and Mr. Emile F. Williams found an intermediate plant in a sphagnous swamp in Norfolk County, Massachusetts, and in 1900 Williams published[1] an account of it and an illustration as *B. iodandra;* and Bicknell, finding the same intermediate plant on Nantucket, took it in 1915 to be unquestionably *B. iodandra*, but stated that "It is found also on Martha's Vineyard and apparently, also, on Long Island, not always, however, perfectly maintaining the characters of its typical form, and certain rather dubious examples undoubtedly raise the question whether it may not be intergradient with *Bartonia paniculata.*"[2] Subsequently, partly in response to an argument for which I am responsible, Bicknell has dropped[3] *B. iodandra* from his Nantucket list; but our extensive collections from Nova Scotia and a prolonged but unsuccessful endeavor to findtrue specific characters for *B. iodandra* convince me that both he and Williams originally hit very near the truth. On its constantly less deeply cleft calyx and its larger corolla *B. iodandra* can be maintained as a Newfoundland variety of *B. paniculata*, while the intermediate plant of Nova Scotia at least is best treated as a transitional variety.

But, to return to the barren at Lower Argyle. The slightly elevated, bushy knolls in the barren were often covered by a dwarfed and contorted form of the coastal plain *Thelypteris simulata*, already

[1] Williams, Rhodora, ii. 55, t. 15, fig. 5 (1900).
[2] Bicknell, Bull. Torr. Bot. Cl. xlii. 33 (1915).
[3] Bicknell, Bull. Torr. Bot. Cl. xlvi. 423 (1919).

found by us, but now, as it was maturing, becoming more obvious than heretofore. *Drosera longifolia* and *D. rotundifolia* were, of course, abundant but a plant which exactly combines their characteristics and which is unquestionably a hybrid between them was found on only one knoll.

Suddenly Long remarked: "If we were in southern Jersey we should call this *Agrostis elata*." And surely that is what it proves to be but, instead of being confined to the Argyle barren *A. elata* Pursh, heretofore recorded from east of Long Island only on Nantucket,[1] was found on all the boggy barrens from Digby and Yarmouth Counties to Queens. Dr. St. John got it on Sable Island; he, Long and I collected it in 1912 on the Magdalen Islands and it is common in Newfoundland. Many of the specimens are absolutely inseparable from material from Pursh's type region (New Jersey), but others have conspicuously awned spikelets. These vary in length from 3.3–4 mm. and in this outlying Canadian and Newfoundland area the plant passes clearly into *A. hyemalis* and its var. *geminata* (Trin.) Hitchc. *A. elata* seems, therefore, to be a coastal plain extreme of *A. hyemalis* with very long spikelets, rather than a variant of *A. perennans* with which Hitchcock unites it.

Late in the afternoon, having made a good cross-section of the barren, we turned toward the sea-shore and, in following a path through an alder thicket, found a carpet of the European *Potentilla procumbens*, here, as when we afterward saw it at Baddeck, too near a cow-path for us to consider it indigenous. On the sea-beach *Rumex pallidus* was in prime condition and *Suaeda americana* was maturing. We had scarcely begun observing the beach plants when a downpour of rain warned us to hurry toward the village and the station, but, in scrambling through the bushes above the beach, we came upon such a handsome and now fully ripe colony of *Carex panicea* that we temporarily ignored the rain to dig some good specimens.

The southern shore of Salmon Lake had yielded so many good things that we were all anxious to see more of the sandy and peaty beach, and especially to extend our exploration up the wholly unsettled west side of the lake. So, on August 13, we landed at the brook where *Polygonum robustius* luxuriates. The boggy swale nearby had

[1]Bicknell, Bull. Torr. Bot. Cl. xxxv. 192 (1908).

Juncus subcaudatus and a peculiarly brittle and fastigiate-branched extreme of *Bartonia paniculata*, a variety heretofore known only from Sable Island. *Thelypteris simulata* was abundant in spruce and alder thickets and the handsome *Aster nemoralis*, var. *major* Peck[1] was beginning to bloom. The *Lycopus uniflorus* of these thickets had an unfamiliar appearance and upon returning to Cambridge I find it to be var. *ovatus* Fernald & St. John[2], recently described from Sable Island and Canso.

The blackish-fruited Chokeberry, *Pyrus arbutifolia*, var. *atro-purpurea*, is everywhere abundant in western Nova Scotia and had for some time shown its characteristic color, but here many of the smaller-leaved shrubs had the small berries just reddening and were obviously typical *P. arbutifolia*, not positively known nearer than Cape Cod and Plymouth County, Massachusetts. The inundated sandy margin of the lake was carpeted with unusually fine *Subularia aquatica* and a stranger happening along would have been amazed to see five men standing in water above their knees, bent over and intently watching the bottom and every few seconds making a plunge to the shoulder with the right arm. After lunch Bissell and Dr. and Mrs. Graves started toward Tusket to catch the train; but Long, Linder and I, having determined to make a circuit of the lake, kept on to the north. Everywhere the thicket was bordered by *Rubus tardatus* of Cape Cod and of York County, Maine, one of the most characteristic blackberries of these lake margins; and the ledgy shores had colonies of the *Panicum* so characteristic of the coastal region of southern New England, which has been referred to *P. virgatum*, var. *cubense*.

Approaching sunset warned us before we had got half the length of the west shore that our plan to encircle the lake was too ambitious. The fog was still with us and during the eight-mile road-walk into Yarmouth we amused ourselves vainly attempting to make out the outlines of more than two of the roadside telephone poles at a time, —an index to the extreme density of the atmosphere. It was some days after this, when the uninterrupted fog was in its fourth week,

[1] ASTER NEMORALIS Ait., var. MAJOR Peck, N. Y. State Mus. Ann. Rep. xlvii. 155—reprint, 29 (Jan., 1894). *A. nemoralis*, var. *Blakei* Porter, Bull. Torr. Bot. Cl. xxi. 311 (July 20, 1894).

[2] Proc. Bost. Soc. Nat. Hist. xxxvi. 92 (1921).

that Mrs. Graves wrote home that they had been there for a week but had not *seen* Yarmouth yet. Nevertheless, in spite of this heavy blanket of fog and the naturally late spring, green corn was maturing in Yarmouth gardens; such summer-flowering plants as *Xyris caroliniana*, *Habenaria blephariglottis* and *H. psycodes*, *Bartonia virginica* and *Gratiola aurea* were as early as in southern New Jersey; and such autumn-flowering plants of New Jersey as *Spiranthes cernua*, *Chelone glabra*, *Solidago puberula*, *S. sempervirens*, *S. rugosa*, *S. Elliottii*, *S. uniligulata* and *S. graminifolia*, *Gnaphalium obtusifolium*, *Cirsium muticum* and *Prenanthes trifoliolata*, in southern Nova Scotia begin flowering in midsummer, often a full month earlier[1] than in southern New Jersey. Another peculiarity of this region of Nova Scotia, one which we were tempted to attribute to the dense and protracted fogs, was the almost complete lack of mosquitoes. We had been most happily surprised to find that we could go anywhere on these boggy barrens without meeting this much-to-be-expected tenant. But in explanation some one suggested during the summer, that in such a dense atmosphere mosquitoes, if they there exist, must remain in the larval stage, wings being quite useless to them!

The Tusket party brought in a very extreme plant of the *Carex Goodenowii* affinity, only in this plant the perigynia have long, slender stipes. This proves to be *C. Goodenowii*, var. *strictiformis* (Bailey) Kükenth. an endemic American variation which, in its extreme development, is very definite. And, to my delight, they had typical *Ranunculus Flammula*, the handsome subaquatic plant of Europe which I had known in eastern Newfoundland, now for the first time collected on the mainland of eastern North America. At Tusket it

[1] Our earliest flowering specimens from Nova Scotia and the earliest date of flowering in southern New Jersey (copied from Stone's *Plants of Southern New Jersey*) are given below.

	Nova Scotia	Southern New Jersey
Spiranthes cernua	August 31	early September
Chelone glabra	August 4	late August
Solidago puberula	July 21	early September
Solidago sempervirens	August 10	early September
Solidago rugosa	August 10	late August
Solidago Elliottii	August 13	early September
Solidago uniligulata	July 20	early September
Solidago graminifolia	August 9	late August
Gnaphalium obtusifolium	August 7	late August
Cirsium muticum	July 13	mid-August
Prenanthes trifoliolata	August 10	late August

grows in its characteristic habitat, a cold spring-brook. And Mrs. Graves was absolutely positive that, just as they were boarding the train at Tusket, a woman, who drove up in an automobile, had in her hand a bunch of the so-called Plymouth Gentian, *Sabatia Kennedyana* Fernald,[1] the most beautiful wild flower of the Cape Cod region. We should, perhaps, have been content with our collections of the day and not have insisted on pressing Mrs. Graves with the illogical query: "Why in the world didn't you ask where she got it?" Obviously, it would have been useless, for the train had started. But that unexplained *Sabatia* haunted us and we could not drive it out of our minds.

Two days were necessary to get the presses in order before leaving, on August 16, to examine the coastal sands of Queens County, our headquarters for two days being at Port Mouton (everywhere in Nova Scotia pronounced "Port Mut-toon"). Promptly after dinner Graves, Long and Linder started for the dunes at Central Port Mouton, bringing back such novelties as *Juncus bufonius*, var. *halophilus*, *Euphorbia polygonifolia* and, from a bushy pasture, a greater variety of *Crataegus* than we had yet seen. They also had found again *Polygonum Raii* and *Sagina nodosa* which we had seen in the damp sands at Villagedale. Bissell and I were having better luck. We had gone to the mouth of Broad River where, until a violent storm of the preceding winter tore it away, a great range of dunes had long existed. We found the sand-plants the others were getting and in one strip of brackish sands a few plants of the rare *Rumex maritimus*, var. *fueginus* (Phil.) Dusen,[2] formerly known from Sable Island and the Magdalen Islands but not from the mainland of Nova Scotia. A beautiful little boggy pocket in the midst of hideously burned and charred spruce woods gave us some of the coastal plain specialties we had been getting in Yarmouth County: *Schizaea pusilla*, *Thelypteris simulata*, *Juncus subcaudatus*, *Ilex glabra* and the two Bartonias of sloughs.

Next morning we all went to the dunes at Central Port Mouton, hoping by further exploration to add some species we had expected to see in such a habitat, but the most interesting discovery was to find that the typical dune species, *Carex silicea*, was quite absent from the

[1] Rhodora, xviii. 150, t. 121 (1916).
[2] See St. John, Rhodora, xvii. 81 (1915).

dunes but growing in the crevices of a rocky headland along with *Smilacina stellata*, which we had also failed to see on the dunes. In a boggy thicket we were somewhat surprised to find the tangle of *Ledum groenlandicum* (subarctic) and *Ilex glabra* (Louisianian) stretching above our heads, and specimens of the *Ledum* which we collected show the trunks and main branches to be practically 2 m. (19.5 dm.) high.

In the afternoon Bissell and Graves went to the mouth of Broad River, returning with *Conioselinum chinense* from a patch of rich, old woods, and bringing in the largest *Bartonia virginica* of the season (3 dm. high).

Long, Linder and I spent the afternoon near Port Joli (pronounced Jolly) following a supersaturated corduroy-road back to Louis Lake, which had been described to us as shallow and "full of weeds." The border of the lake proved to be a quaking bog and, without a boat, we were forced to content ourselves with merely imagining all sorts of exciting things in the swimming mass of vegetation. The *Ilex verticillata* in the bog had densely pubescent leaves, var. *padifolia*, which we had not known east of Massachusetts, and the bog itself was the home of *Arethusa*, now abundantly fruiting and a welcome sight in view of its rapidly approaching extinction in the eastern states.

Next morning there was time for some short local tramps before the early afternoon train back to Yarmouth, but the only striking novelty was *Crataegus Jonesae*, one of the most definite of species, supposed to be confined to the Maine coast, brought in by Bissell and Graves from the shore east of Port Mouton.

The Graves's time was getting short and there were too many things to do, so it was necessary to crowd the program. We were planning another trip away from Yarmouth, to start early on the morning of the 21st, but we decided that on the 20th we could take a simple automobile trip into the interior, just to see what the country was like; and since we had previously failed to reach our destination, when we started for Carleton and Kemptville, that direction seemed the natural one to take. Our route lay up the Tusket valley and, after a few stops, we succeeded in getting above Tusket Falls, when some one thought he saw an interesting plant on a wooded slope above Tusket (or Vaughan) Lake. The shore of the lake was

obviously of no interest, being bushed close down to the water and with absolutely no beach exposed, but, tiring of waiting for the others to return, I pushed idly through the bushes to the water's edge and there, with flowers fully expanded under several inches of water, was the beautiful Plymouth Gentian, *Sabatia Kennedyana*, the Rhode Island and southeastern Massachusetts representative of *S. decandra* of southern Georgia and Florida (fig. 12). Mrs. Graves's observation was splendidly corroborated, and we could not pass such a spot even if Carleton and Kemptville again had to wait. With the *Sabatia*, deep under water, were the coastal plain *Coreopsis rosea*, its previous northeastern outposts in eastern Massachusetts; typical *Habenaria flava*, the *Asclepias incarnata* of Grand Lake and *Rynchospora capitellata*, var. *discutiens* again; and, best of all, a very evident relative of the southern *Panicum longifolium*, the latter species (fig. 16) known as far north as New England only in southern Connecticut and adjacent Rhode Island. Our consciences were becoming troubled by the full boxes (we had merely gone for a ride) of specimens to be cared for and thoughts of that early train next morning so, just as on the previous trip up this valley, we drove on only to Pleasant Valley, where we took a crossroad to Yarmouth. But, as we were turning, Bissell spied in the sand near Sloane Lake, a goldenrod of the *Euthamia* section, which we had not had, the typical thin-leaved, coastal plain *Solidago tenuifolia*, previously unknown east of York County, Maine, though abundantly represented in Nova Scotia by the endemic variety of pond-margins (p. 143).

In September, 1917, Mr. Chesley Allen collected,[1] on a savannah between Little River and East Ferry on Digby Neck, a single plant of *Lophiola*, a most characteristic plant previously unreported from north of the New Jersey pine barrens, and all summer we had been awaiting the right opportunity and settled weather in order to go for a few days to Digby Neck, not only to rediscover *Lophiola* if possible but because we took that plant to be an index to a probably interesting lot of isolated coastal plain species. Anyone who knows the montane character of Digby Neck, forming a slender continuation, in places less than a mile wide, of the North Mountain for about 40 miles between the Bay of Fundy and St. Mary's Bay,—anyone who knows this slender montane peninsula with the bleak

[1] See Nichols, Rhodora, xxi. 68 (1919).

Bay of Fundy washing its outer shores would think us crazy to go there for coastal plain plants. But we could not overlook the occurrence of *Lophiola* there. So, as the psychological moment had come, the weather clearing, with wind in the west, we went on the 21st by train to Weymouth, thence to cross by boat in the late afternoon (when the tide would be right for going down Sissiboo River) to Sandy Cove on the Neck.

Before time for the boat we collected extensively about Weymouth, sending our plants back to Yarmouth by Bissell who had elected to return and to care for the accumulated material during our absence, and before supper the rest of our party landed at Sandy Cove, a beautiful harbor shut in by basalt cliffs. As we landed we wondered where in such a place to look for plants of the sandy coastal plain, but upon leaving the wharf we saw by the damp roadside carpets of the Nova Scotian purple gerardia, *Agalinis neoscotica*, northern representative of a coastal plain genus.

East of Sandy Cove lies a large lake, Lake Midway or Centerville Lake, and south of that a small pond in the woods, and to the west, at the head of Little River, the map indicated a chain of small lakes. So, on the morning of August 22, the Graves's and Linder were driven east to Lake Midway and Long and I went west. Our driver, Mr. R. W. Sypher, who knows the Neck intimately, told us that the lake east of Tiddville had been drained in order to quarry the infusorial earth which had formed its bed, and, when we first caught sight of one of the small remaining pools beyond some hills, we hurried across to prospect, and there was *Lophiola*, tall and just coming into bloom, acres and acres as far as the eye could see. There was obviously no need to go as far as East Ferry, so we drove only to Tiddville and spent the day following the savannah eastward along the Little River, a stream which might often be crossed "in two jumps." Our list for the day is a long one so it must be here cut down to the specialties, most of the distinctive coastal plain plants of the Yarmouth County bogs: *Schizaea*, *Xyris caroliniana* and *X. montana*, *Calamagrostis Pickeringii*, *Carex exilis*, *Lycopodium inundatum*, var. *Bigelovii* and *Ilex glabra;* in the pools and small pond-holes *Utricularia purpurea* and *U. geminiscapa*, *Nymphaea odorata*, var. *rosea*,[1] and

[1] The flowers of *Nymphaea odorata*, var. *rosea* are by no means always pink, in fact they oftener have white inner petals. The plant is more familiarly known as

Eleocharis Robbinsii; and, rare in the mud, *E. olivacea;* a pretty good list of coastal plain types to find within half a mile of the cold rocks of the Bay of Fundy. *Lophiola* was abundant, coloring the savannahs for two or three miles with its misty, white corymbs, its yellow-bearded and reddish expanded perianths certainly suggesting the English name, Golden Crest.

The genus *Lophiola*, although placed by Bentham & Hooker in the *Haemadoraceae*, is by other systematists placed in the tribe *Conostylideae* of the *Amaryllidaceae*. This tribe has 50 species confined to southwestern Australia, 1 species at the Cape of Good Hope and the genus *Lophiola*, with three localized areas: one extending from Mississippi to Florida and southern South Carolina; another the pine barrens of New Jersey and adjacent Delaware; the third, the savannahs on Digby Neck (fig. 17). But the plant of Digby Neck has a further claim to interest. The genus was based on a plant said to have been carried back to England by John Lyon in 1812 and there cultivated and, in 1813, illustrated and described from a plant which flowered in England. Lyon, it would seem, from what little is recorded of him, had lived at Philadelphia until, in 1806, he returned to England "with 14 new spp."[1] He soon returned to America and devoted his energies to botanical exploration of North and South Carolina, Georgia and Florida, whence he returned to England in 1812; "he assiduously explored this region [the Carolinas] from Georgia as far north at least as the Grandfather Mountain, and died at Ashville . . . . . some time between 1814 and 1818."[2]

Now the case would not be specially complicated if *Lophiola aurea* were, as has been generally supposed, a monotype; but close study shows that the plants of the three different areas are quite distinct species, the plants of the South and of New Jersey having olivaceous capsules free from the perianth only above the middle and seeds

var. *minor* Sims, but the latter name was substituted by Sims for Pursh's earlier one because, when cultivated in England, the variety had white flowers. The bibliography is as follows:

Nymphaea odorata, var. rosea Pursh, Fl. Am. Sept. 369 (1814). *N. odorata*, var. *minor* Sims, Bot. Mag. t. 1652 (1814); Conard, Waterlil. 183, fig. 68 (1905). *N. minor* (Sims) DC., Veg. Syst. ii. 58 (1821). *N. odorata*, var. *parviflora* Raf., Med. Bot. ii. 45 (1830). *N. rosea* (Pursh) Raf., l. c. (1830). *Castalia odorata*, forma *rosea* (Pursh) Britton, Cat. Pl. N. J. 44 (1889). *C. odorata rosea* (Pursh) Britton acc. to Morong, Mem. Torr. Bot. Cl. v. 154 (1894).

[1] Britten & Boulger, Biogr. Ind. Brit. and Irish Bot. 109 (1893).

[2] Gray, Lond. Journ. Bot., i. 11 (1842).

blunt at both ends, the Nova Scotia plant, as shown by fruiting material collected in October by Mr. Sypher, having the red capsules free two-thirds their length and bearing seeds which are commonly tailed at one end. The two southern plants flower in early summer, the Nova Scotian from mid-August to October. The great difficulty arises in interpreting the original description and plate, for the plate, in such characters as are shown, very closely matches Nova Scotian material but is not a good match for most specimens of either the New Jersey or the more southern species.

I have been generously loaned or have had access to all the material of *Lophiola* in the herbaria of the New York Botanical Garden, the Philadelphia Academy of Science, the National Museum and the Missouri Botanical Garden and in all the collections find but two sheets, both collected somewhere in Florida by Rugel, which compete with the plant of Digby Neck in resembling the original plate of *L. aurea*. These two sheets are of unusually large-flowered material of the southern species, and, when we bear in mind what we know of Lyon's movements between 1806 and 1812 and that the plate was made from cultivated material, it seems wiser to apply the name *L. aurea* to the southern plant than to force it upon the superficially somewhat similar plant of Nova Scotia. The Nova Scotia plant should, therefore, be treated as a new species, the New Jersey plant being *L. americana* (Pursh) Wood.

Graves and Linder found Midway Lake with a bouldery and uninteresting shore, though at one point they were able to get *Myriophyllum tenellum* and a beautiful lot of freshly flowering *Utricularia resupinata* (from Florida north), making our ninth species of the genus. They also got *Potamogeton Oakesianus* and *P. bupleuroides*, the latter species new to our collections, and on the Fundy shore, Graves got *Sedum roseum* and *Polygonum allocarpum*, both typical plants of this coast.

Before leaving Sandy Cove for Digby on the 23rd, Long and I stole out in the early morning to the little pond which lies almost in the village. We were told: "It never had a name, but some folks call it Lily Lake;"—so we will call it Lily Lake. In a deep muddy cove were two splendid plants, the northern *Myriophyllum Farwellii* (alpine ponds of Gaspé to northern New England, northern New York and northern Michigan) and, mingled with it, that hand-

some pondweed with purple-mottled stems, *Potamogeton pulcher*, heretofore unknown northeast of Nantucket and of York County, Maine (fig. 15).

After the Sandy Cove trip Dr. and Mrs. Graves felt that they must get back to Connecticut and we attempted to forget the loss of their good comradeship by ourselves travelling as far in the opposite direction—to Cape Breton; Bissell and Linder to North Sydney as a base, Long and I to Baddeck, to the hospitable home of Mr. and Mrs. Charles T. Carruth of Cambridge. The region including Baddeck and North Sydney had already been much botanized by John Macoun and by many amateurs, so that we anticipated no noteworthy discoveries; but we naturally wanted a glimpse of this region of Carboniferous sandstones, gypsum-cliffs and limestones, especially to compare it with the acid southwestern counties. And the comparison was truly a contrast. We saw absolutely none of the coastal plain specialties which all summer had occupied our concentrated attention. Around the gypsum outcrops at Port Bevis (near Baddeck) were many of the species which Long and Pease had got in similar habitats along 5-Mile River or which we had from Truro: *Cystopteris bulbifera, Carex eburnea, Sphenopholis pallens, Erigeron hyssopifolius*, etc. in the rock crevices; *Pteretis nodulosa, Poa costata, Carex retrorsa, Ranunculus recurvatus, Solidago latifolia* in the woods; *Ranunculus Purshii* in the pools; and a few we had not previously seen: *Shepherdia canadensis* in the talus, *Gnaphalium sylvaticum* in pastured woods and other half-natural but doubtfully native habitats, *Cornus Amomum* along a brook, and the boreal *Scirpus pauciflorus* in the border of a salt marsh near Baddeck where the southern *Distichlis spicata* abounds. In a cold brook with *Potamogeton alpinus*, was a vigorous growth of *P. vaginatus* Turcz.,[1] a boreal, circumpolar species not before known in Nova Scotia, and here, as on Prince Edward Island, in New Brunswick and on the Labrador Peninsula, without good fruit; and at the mouth of a brook entering Baddeck Bay the colony of *Thelypteris palustris* (*Aspidium Thelypteris*) was as deliciously fragrant as Vanilla Grass (*Hierochloe odorata*). This fragrant form of the Marsh Fern has been previously known from a collection made by Miss Sarah F. Sanborn in southern

[1] See St. John, Rhodora, xx. 191 (1918).

New Hampshire. It is *Thelypteris palustris*, forma *suaveolens*.[1] We had hoped to find new stations for the two local species, *Polygonum acadiense* (already referred to, p. 134) and *Agropyron acadiense* Hubbard,[2] which Dr. St. John and I had discovered in 1914 at Grand Narrows, but, in our searching of the beaches about Baddeck, Long and I found only a solitary plant of the *Polygonum*, on Kidstone's Island, here, as at Grand Narrows, associated with *P. Raii*, and at this station with *Agropyron pungens* clearly passing into *A. acadiense*.

Bissell and Linder, in the meantime, were having their best collecting in the rich woods about a lime quarry on a mountain near George River. They got many of the species we were finding and some others new to our summer's collections: gigantic *Thelypteris Filix-mas* (L.) Nieuwl., the only *Cystopteris fragilis* of the whole summer, *Athyrium acrostichoides*, *Carex Bebbii*, *C. aurea*, *Satureja vulgaris* and other plants of sweet or basic soils, though at the leached summit of the mountain they found a typical acid bog with *Rubus Chamaemorus* and the other common acid bog plants.

Dr. and Mrs. Webster having told me of a spot near Gavelton, on the Tusket, where they had found *Sabatia Kennedyana* without having to reach under water for it, as we had been forced to do, Dr. Webster most kindly took Long and me to the station on the morning of September 2nd, and there, near the foot of Gavelton (or Butler) Lake, he introduced us to a most fascinating savannah. Our time was very limited but enough to indicate what was to be the next day's work. Unfortunately Bissell could not share in this, one of the best days of the season, for he returned home on the night of the 2nd; but on the 4th Long, Linder and I went to Gavelton prepared for a full day of collecting.

Sabatia was abundant both on the wet savannah and the cobbly beaches and, of course, all the specialties we had previously found with it. *Proserpinaca palustris* and *P. pectinata* (Florida to southern Maine), the Atlantic American representatives of the tropical and austral tribe *Halorrhageae*, a tribe with most of its species in Australia, were abundant on the savannah and with them, clearly a hybrid of the two, as it likewise seems to be in eastern Massachusetts

[1] THELYPTERIS PALUSTRIS Schmidel, forma **suaveolens** (Clute), n. comb. *Nephrodium Thelypteris*, forma *suaveolens* Clute, Fern Bull. xviii. 87 (1910).

[2] RHODORA, xix. 15 (1917).

and Rhode Island, *P. intermedia* Mackenzie,[1] originally described from the pine barrens of New Jersey and from Georgia. *Polygonum Muhlenbergii*, first east of the Penobscot, *P. robustius* and *Glyceria pallida*, first east of southern Maine, abounded. The southern *Panicum dichotomiflorum* grew on shores or at the border of the savannah, and the tall clumps of *Juncus canadensis* had an unusual appearance owing to the very few (3–7) flowers in the scattered glomerules borne on long, almost erect branches, the inflorescence thus suggesting that of *J. brevicaudatus* but the plant clearly an extreme variation of *J. canadensis*, with the perianths unusually long for the species (3.5–4 mm. long). Typical *J. canadensis* has the flowers very numerous in the glomerule, the branches less rigidly erect and the perianth from 2.5 to very rarely as much as 3.5 mm. long. Linder and I later (in October) traced the extreme variety nearly to the headwaters of the East Branch of the Tusket, and although it sometimes intergrades with typical *J. canadensis* it seems worthy of recognition as a variety. Upon looking up the collections made by Long and me on Cape Cod in 1918 I find that at one of the ponds in Dennis we got this same peculiar variety of the Tusket valley.

On the beach of the lake *Woodwardia areolata* of southern, wet cypress swamps and *W. virginica* of coastal plain quaking bogs were growing among the cobble-stones, and the finest Bog Cranberry, *Vaccinium macrocarpon*, I had ever seen was here trailing over the quartzite boulders; while the dominant blueberry of the rocky shore was *Vaccinium vacillans*, heretofore unknown in New England east of southern York County, Maine, although there are records of it from Nova Scotia.

This was to have been our last day in the field, for the calls of home and the opening of the academic year could not be indefinitely postponed, but it did seem "hard luck," just as we were packing to leave Nova Scotia, that the isolated coastal plain types were so rapidly developing. By working overtime, however, and blessed at last by brilliant September sunshine, we got the presses into shape and took just one more day in the field. On September 6 we went over the only bad road we encountered in Yarmouth County, to Great Pubnico Lake, a splendid lake but with water, as everywhere else, uncomfortably high. On the sandy shore with the

[1] Mackenzie, Torreya, x. 250 (1910).

conventional but still very choice coastal plain species was *Rhexia virginica*, which we had had only from Randel Lake; but the great surprise was a boggy savannah at the border of the lake where, at least close to the lake, the two dominant sedges were the northern *Carex oligosperma* (Labrador to Great Bear Lake—at the Arctic Circle, south to northern Pennsylvania, Michigan and Minnesota) and *Eleocharis tuberculosa* (Texas to Florida and north to eastern Massachusetts, see fig. 14). On the way back to the railroad and again near Pubnico station we were greatly interested in *Spiranthes cernua*, var. *ochroleuca*. Typical white-flowered *S. cernua*, with delicious fragrance suggestive of the Pond Lily, had been common and blooming freely in sterile meadows but this much larger plant with elongate bracts and yellowish flowers of disgustingly pungent odor was just beginning to bloom and grew in dry habitats, either open, sandy fields or rocky barrens.

After making a circuit on the 7th, to secure fruiting material of *Rubus* and other specialties, we quickly packed the boxes and on the 9th sailed on the Prince Arthur, satisfied with our summer's work, though fully conscious that we had barely scratched the surface. Of the more than 2,600 lakes in the silicious belt we have visited exactly 40 and have almost made the circuit of just 1; of the innumerable savannahs and inland marshes we have been on 4; we have not touched the sandy valleys of the Clyde, Roseway, Jordan, Sable and other rivers to the east; the regions where *Ilex opaca* and *Rhododendron maximum* have been reported are still to be investigated; and we have not yet located *Ceratiola*.

But the season was not yet over. Many problems promptly arose as soon as the material was unpacked, so, on October 5, Linder and I sailed on the Prince George back to Yarmouth where we spent three strenuous days, out from sunrise to sunset, collecting fruit of critical groups and adding whatever of novelty the lateness of the season would allow.

A *Bidens* growing in a cold bog at Sand Beach, a plant we had earlier collected in the most immature condition, seems like *B. connata*, var. *gracilipes* Fernald[1] of the Cape Cod quagmires but its achenes are nearly twice as long; apparently an endemic variety. At last we reached Carleton and Kemptville, trailing *Sabatia Kennedy-*

[1]Rhodora, xxi. 103 (1919).

ana, Panicum longifolium, etc., all the way and later to the head of the East Branch of the Tusket where we also found *Rhexia virginica, Proserpinaca pectinata* and *Polygonum robustius*. There are some beautiful savannahs on the East Branch which, earlier in the season, would repay careful exploration. At the border of one was as handsome a *Polygonum* as I ever saw, a slender perennial, obviously a variety of *P. hydropiperoides*, but extremely tall (1–1.5 m.), with leaves almost 2 dm. in length, and with the thick (often 1 cm.) pink spikes sessile in mostly digitate fascicles at the tips of the branches. Typical *P. hydropiperoides*, which we found common in Yarmouth County, has much shorter leaves and the more slender spikes (commonly described as "filiform") scattered along the flowering branches.

This was the end of the collecting but only the beginning of the more exacting and unending task of accurately working out the results—17,000 sheets of carefully prepared specimens representing 3,600 numbers, nearly every isolated species to be intensively studied, lest, like the *Lophiola*, we should superficially place it with the wrong species. And, although the detailed results cannot yet be fully stated, it is now safe to say that, of the indigenous vascular flora of silicious southwestern Nova Scotia, approximately 150 out of the 800 known species are either isolated from the more continuous coastal plain flora of the South or are endemic derivatives from it, while such a typical coastal plain genus as *Bartonia* seems in Nova Scotia to be more highly developed than on the coastal plain itself. Further exploration will greatly increase the proportion of isolated coastal plain types, for we have glimpsed scarcely 1% of the silicious area and most of the significant plants are highly localized and found where least expected. But if there were need of further evidence that, since the Pleistocene glaciation the continental shelf of eastern North America has been high in the air, affording an essentially continuous line of migration across the mouth of the Gulf of Maine to Nova Scotia, thence to Newfoundland, that evidence is now abundantly at hand. A striking feature of this migration northward of the southern coastal plain flora is the fact, that several distinctive species or genera, *Schizaea pusilla* (fig. 11), *Lophiola* (fig. 17), *Habenaria flava*, and perhaps *Ceratiola*, reached Nova Scotia without establishing colonies on Long Island, Cape Cod or Nantucket. This would seem to indicate that the uplifted shelf was a region of some

complexity or else some subtle qualities in the habitats of these plants.

And what of the much overworked life-zones based alone upon temperature? In a region where the Louisianian[1] *Lycopodium inundatum*, var. *Bigelovii* (*L. adpressum*) and the Louisianian and Carolinian *Utricularia subulata* (fig. 4) creep among the bases of *Carex Goodenowii* (Greenland and arctic America, south to Nova Scotia and eastern Massachusetts) or of *Juncus filiformis* (Greenland to Massachusetts and the mountains of Pennsylvania); where the Louisianian and Carolinian *Eleocharis tuberculosa* (fig. 14) vies with *Carex oligosperma* (Labrador to Great Bear Lake, etc.) for the possession of the edge of a savannah; where the dominant undergrowth in the spruce, fir, and larch swamps includes the Louisianian and Carolinian Inkberry (fig. 3), and such a distinctly southern plant as *Solidago Elliottii;* where the Inkberry makes tall thickets with *Ledum groenlandicum* or pushes its branches through the carpet of arctic Crowberry, *Empetrum nigrum* (fig. 2), or the arctic Cloudberry or Bakeapple (*Rubus Chamaemorus*);—in a region where these commingings of Arctic or Hudsonian with Louisianian or Carolinian species are met at every turn, one is certainly perplexed to make Merriam's zones fit the facts. My friends in the more arid and elevated regions of the West seem to find them of practical value, and in our own upland country they are useful concepts if their use is constantly tempered by that rarest of virtues, sound judgment; but in our humid and lowland regions of the Northeast they are so tangled that it is doubtful whether a commensurate return can be gained from the effort to untangle them. Incidentally, Merriam makes the moose an indicator of the Hudsonian. How lost this great animal must feel in Yarmouth County as it breaks its way through the thickets of Inkberry and tangles of Green Brier to the lake-margins, there to browse on the Louisianian and Carolinian *Brasenia*, *Nymphoides* or *Solidago tenuifolia!*

I have laid great emphasis upon the seemingly unfair proportion of fog and "Scotch mist" in southwestern Nova Scotia, although we were constantly assured that we were having "beginner's luck" and seeing an abnormal summer. I have also indicated the very

[1] The warmer "zones" to which the southern species are accredited are those indicated for them in Mohr's *Plant Life of Alabama*.

diverse habitats of coastal plain plants in that region: *Schizaea pusilla* growing either in the wettest of sphagnous quagmires, in the dryish Cladonia heath or even in rock-crevices; *Woodwardia virginica,* of quaking bogs southward, or *W. arcolata,* of our wet or mossy woods, taking to cobble beaches; the Bog Cranberry reaching phenomenal development among quartzite boulders; the Inkberry indifferent whether it grows in the deep shade of spruce woods, on open sphagnous bogs or in dry blueberry pastures; *Panicum Lindheimeri,* of dry open sands southward, represented in Nova Scotia by a plant of inundated quagmires; and *Solidago tenuifolia,* of coastal plain sand-plains, with a Nova Scotian representative found only in the lake-margins. Is not this very general interchange of habitats due, to a great extent, to the unusually moist atmosphere and greatly retarded evaporation? Where there is abundant moisture everywhere the plants secure what they need, even in comparatively dry habitats.

Another point, and the last: in the areas we explored, this remarkable flora derived from the southern coastal plain was restricted to or at least obvious only in the region of acid rock, the "gold-bearing series" and their adjacent granites, the cool Atlantic slope of Nova Scotia or (as on Digby Neck) in extensive areas of acid savannah. Wherever we tapped the regions with limestone, gypsum or basalt, regions with but slightly acid or sweet or basic soils, the coastal plain types were found only on sphagnous bogs or on long-weathered and leached crests or open plains. Instead, as at George River, Port Bevis, Baddeck, Truro, Folleigh, 5-Mile River and the southern slope of the North Mountain, the plants which gave distinction to the regions were such Canadian or Alleghenian calcicoles or denizens of rich woods as *Thelypteris Filix-mas, Cystopteris bulbifera* (fig. 6), *Pteretis nodulosa, Equisetum scirpoides, Milium effusum, Sphenopholis pallens, Festuca nutans, Asperella hystrix, Carex rosea, C. aurea, C. eburnea, Juncus Dudleyi, Listera convallarioides, Ostrya virginiana, Laportea canadensis, Ranunculus Purshii, R. recurvatus, Dentaria diphylla, Amelanchier canadensis* (fig. 8), *Fragaria vesca,* var. *americana, Geum virginianum, Geranium Robertianum, Shepherdia canadensis, Circaea latifolia* and *C. canadensis, Aralia racemosa, Sanicula gregaria, Osmorrhiza Claytoni* and *O. divaricata, Satureja vulgaris, Solidago latifolia, S. serotina* and *Erigeron hyssopifolius* (fig. 7).

These conclusions are based upon careful records, entered every night for more than two months by all members of the party, of everything seen during the day. They show very emphatically that, whereas the distinctive flora of the highly acid but cool Atlantic slope of Nova Scotia has been derived very largely from the now submerged continental shelf and has its affinities far to the south, the distinctive flora of the warmer, inland and less acid or even calcareous regions of the province, the regions of farms and apple and peach orchards, has come from the north, northwest or west by way of New Brunswick. This situation suggests the contrasts in the flora of Newfoundland elsewhere discussed,[1] where the cold, foggy and bleak acid southeastern region is distinguished by a flora derived from the acid sands and peats of the southern coastal plain; the warmer, sunny, calcareous western region by a calcicolous flora allied to those of the calcareous Arctic Archipelago and the Canadian Rocky Mountains.

(To be continued.)

[1]Fernald, Am. Journ. Bot. v. 237–247 (1918).

THE GRAY HERBARIUM EXPEDITION TO NOVA SCOTIA, 1920.

M. L. Fernald.

(*Continued from p. 171*)

Part 11. Noteworthy Vascular Plants collected in Nova Scotia, 1920.

The published lists of Nova Scotian plants contain so very few records from Digby, Yarmouth, Shelburne, and Queens Counties that it is desirable to make our records from these western counties rather detailed and to enumerate all species which seem to be characteristic of this region as contrasted with the northern and eastern counties. Many species which abound from Digby Neck and An-

napolis County to Cape Breton, in the regions of calcareous or sweet soils, are very rare in the acid western and southwestern counties and, consequently, so far as our limited and somewhat negative observations allow, special note is made of these plants. A large number seen wherever we went, from Yarmouth to Cape Breton—such species as *Polypodium vulgare* L., *Polystichum acrostichoides* (Michx.) Schott, *Onoclea sensibilis* L., *Osmunda cinnamomea* L., *Taxus canadensis* Willd., *Pinus Strobus* L., etc.—are not here specially noted, although species belonging to recently revised genera are freely enumerated. In the following enumerations, the 110 species of plants marked ** are new to the flora of Canada, while the additional 122 marked * are here recorded for the first time, apparently, from Nova Scotia. The names of introduced species are in italics. The International Rules of Botanical Nomenclature are followed.

WOODWARDIA VIRGINICA (L.) Sm. Swampy spruce woods, boggy margins of lakes, savannahs and cobbly lake-shores, rather general in Yarmouth and Queens Cos. See pp. 109, 147, 150, 166, 170. Earlier records eastward to Halifax Co.

** W. AREOLATA (L.) Moore. Very locally in YARMOUTH Co.: upper border of cobble-beach of Butler's (Gavelton) Lake, Gavelton; wet thicket at border of west shore of Randel Lake, Argyle. See pp. 149, 166, 170.

ATHYRIUM ACROSTICHOIDES (Sw.) Diels. *Asplenium acrostichoides* Sw. Rich or calcareous woods. HANTS Co.: Five-Mile River. CAPE BRETON Co.: George River. Various earlier records from Hants and Halifax Cos. to Inverness. See pp. 136, 165.

A. ANGUSTUM (Willd.) Presl.[1] Apparently less common southwestward than var. *rubellum*. Collected at Port Mouton (Queens) and at George River (Cape Breton Co.).

** A. ANGUSTUM, var. ELATIUS (Link) Butters, RHODORA, xix. 191 (1917). YARMOUTH Co.: swampy woods by Eel Lake. Previously known to extend eastward to south-central Maine—see RHODORA xxii. 84 (1920).

A. ANGUSTUM, var. RUBELLUM (Gilbert) Butters, l. c. 193 (1917). The common form of the species at least from Yarmouth Co. to Queens Co.

POLYSTICHUM BRAUNII (Spenner) Fée. To the several records from rich or calcareous areas from Kings Co. to Cape Breton may be added Folleigh, Colchester Co. (see p. 136) and George River, Cape Breton Co.

[1] For discussion of *Athyrium angustum* (*Asplenium Filix-femina* of eastern America, in great part) see Butters, RHODORA xix. 190 (1917).

** Thelypteris palustris Schmidel, forma suaveolens (Clute) Fernald, Rhodora, xxiii. 165 (1921). Open spruce and fir thickets along brook at head of Baddeck Bay, Baddeck.

** T. simulata (Davenp.) Nieuwl., Am. Midl. Nat. i. 226 (1910). *Aspidium simulatum* Davenp. Local, probably somewhat general, Yarmouth Co. to Queens Co. Yarmouth Co.: boggy swales and thickets bordering Lily Lake (near Yarmouth); wet alder thicket at southwest corner of Salmon (Greenville) Lake; bushy knolls in wet peaty barrens, Lower Argyle. Queens Co.: knolls in wet sphagnous spruce bog near Louis Lake, Port Joli; knolls in springy sphagnous bog in spruce woods, near mouth of Broad River. See pp. 104, 154, 156, 158.

T. marginalis (L.) Nieuwl., l. c. (1910). *Aspidium marginale* (L.) Sw. Although common eastward, apparently rare in the southwestern counties. Seen by us in Yarmouth Co. only near Randel Lake, Argyle.

T. Filix-mas (L.) Nieuwl., l. c. (1910). To the numerous stations on Cape Breton Island may be added the region about the limestone quarry, George River. See pp. 165, 170.

T. Boottii (Tuckerm.) Nieuwl., l. c. Frequent in swampy woods and thickets of Yarmouth Co. See p. 104. Jack records it from Halifax Co.

Cystopteris bulbifera (L.) Bernh. Abundant in open woods about limestone and gypsum outcrops; Five-Mile River (Hants), Port Bevis (Victoria) and George River (Cape Breton). See pp. 136, 164, 170. Previously recorded from other calcareous areas from Hants to Cape Breton.

C. fragilis (L.) Bernh., var. Mackayi Lawson, Fern Flora of Canada, 233 (1899). Our only collection was from the vicinity of the limestone quarry at George River (Cape Breton). See p. 165.

Pteretis nodulosa (Michx.) Nieuwl. *Onoclea Struthiopteris* of American authors. Alluvial woods and about limestone or gypsum outcrops, Hants, Victoria and Cape Breton Cos. See pp. 136, 164, 170.

Schizaea pusilla Pursh. At various stations in Digby, Yarmouth, Queens and Halifax Cos. Digby Co.: apparently rare and local in wet peaty hollows in savannahs along Little River east of Tiddville. Yarmouth Co.: sphagnous bog at outlet of Porcupine Lake, Arcadia; sandy and peaty bog, Sand Pond, Argyle; wet peaty sloughs and quagmire-pools or even in depressions of dryish *Cladonia*-covered barrens west of Goose Lake, Lower Argyle. Queens Co.: sphagnous springy bog in spruce woods near mouth of Broad River. Halifax Co.: slaty ledges and cobbly upper beach of Shubenacadie Grand Lake, near Mrs. Britton's station. See pp. 91, 99, 103, 134, 135, 148, 153, 161, 168, 170.

OPHIOGLOSSUM VULGATUM L. Frequent in damp sandy and cobbly beaches of lakes or in sterile meadows, Digby and Yarmouth Cos. Varying from large plants to the smallest extreme (Var. *minus* Moore, *O. arenarium* E. G. Britton) in different portions of individual colonies. See pp. 141, 142.

BOTRYCHIUM SIMPLEX E. Hitchc. Rare: a small colony of extremely dwarf plants, sandy and gravelly beach of Cedar Lake, Yarmouth Co. See p. 102.

B. RAMOSUM (Roth) Aschers. Rare: a solitary plant in mixed woods, southern slope of North Mt., Middleton; previously recorded from Blomidon northward and eastward.

B. DISSECTUM Spreng. and forma OBLIQUUM (Muhl.) Fernald, RHODORA, xxiii. 151 (1921). Frequent or common in sandy or gravelly, either open or turfy soils of Digby, Yarmouth and Shelburne Cos. Recorded by others eastward to Halifax Co. See pp. 141, 151.

B. TERNATUM (Thunb.) Sw., var. RUTAEFOLIUM (A. Br.) DC. Apparently rare in or absent from the southwestern section: seen only at Cedar Lake, Digby Co.

* EQUISETUM LITORALE Kuehl. Very abundant on the wet lower gravelly beach of Shubenacadie Grand Lake (Halifax Co.).

* E. LIMOSUM L., forma POLYSTACHIUM (Brueckn.) Doell; Fernald & Weatherby, RHODORA, xxiii. 47 (1921). Boggy thicket, Hectanooga. See p. 97.

E. HYEMALE L., var. AFFINE (Engelm.) A. A. Eaton. Light sandy or gravelly banks, railroad embankments, etc., through the northern and northwestern counties, west to banks of Sissiboo River, Digby Co.

E. SCIRPOIDES Michx. Rich wooded banks and mossy slopes, Cape Breton to the North Mt., Annapolis Co. See pp. 133, 139, 170.

LYCOPODIUM INUNDATUM L. Common throughout the province.

L. INUNDATUM L., var. BIGELOVII Tuckerm. Sandy and peaty beaches of lakes and in boggy savannahs, common in Digby and Yarmouth Cos. To be expected eastward. Reported in Macoun's Catalogue from Grand Lake, Halifax Co. and from North Sydney and Louisburg, Cape Breton; but the only specimens we have seen of Macoun's material from North Sydney are not characteristic. See pp. 99, 100, 161, 169.

L. ANNOTINUM L., var. ACRIFOLIUM Fernald, RHODORA, xvii. 124 (1915). Less common than typical *L. annotinum*. Seen by us only in spruce and maple swamps by Clement Pond, Barrington (Shelburne Co.) and on a dry bank at Hectanooga (Yarmouth Co.).

L. CLAVATUM L., var. MEGASTACHYON Fernald & Bissell, RHODORA, xii. 53 (1910). Frequent throughout the province.

L. OBSCURUM L. The current descriptions of the two well defined

varieties of this species are often misinterpreted, with the result that much of typical *L. obscurum* is passing as var. *dendroideum*. The two varieties may ordinarily be distinguished as follows:

Branches spreading or recurving, flattened or concave beneath: the linear-lanceolate leaves about 1 mm. broad; the lower (and often the upper) series usually appressed; the lateral spreading: spikes 1.5–4 cm. long, 4–6 mm. thick.
L. obscurum (typical).

Branches erect and crowded, not obviously flattened: the linear-attenuate leaves decidedly less than 1 mm. broad, all incurved-ascending: spikes 2–5 cm. long, 3.5–4.5 mm. thick.
Var. *dendroideum*.

L. OBSCURUM L. The typical form of the plant is common in Nova Scotia.

*L. OBSCURUM, var. DENDROIDEUM (Michx.) D. C. Eaton. Frequent in dry open woods and pastures or clearings, Yarmouth Co. to Lunenburg Co.

*L. COMPLANATUM L. Decidedly rare as compared with the common var. FLABELLIFORME Fernald. Seen only in CAPE BRETON CO.: spruce woods on hill across the river from the quarry, George River.

L. TRISTACHYUM Pursh. Dry barrens, sandy woods and gravelly embankments, apparently frequent throughout. See p. 130.

ISOETES TUCKERMANI A. Br. The abundant species everywhere in the margins of ponds in the silicious regions of the province. In argillaceous regions passing to the stouter but otherwise hardly distinguishable vars. *borealis* A. A. Eaton and *Harveyi* (A. A. Eaton) Clute.

PINUS BANKSIANA Lamb. According to Fernow (Forest Cond. N. S. 11) "Jack Pine (*Pinus divaricata*) is found only in special localities on poorest sites in Colchester county." In Cumberland Co. it is seen from the train to be abundant, mixed with *P. resinosa*, on the hills between Thomson and Atkinson Siding, and in less abundance about Springhill Junction; both regions composed of sterile Carboniferous sandstone. See p. 130. The conservatism of Fernow's statement is further indicated by Fowler's reference to this as "The most common species of pine" in the region of Canso.—Fowler, Ann. Rep. Dept. Mar. and Fish., xxxix. 59 (1907).

*ABIES BALSAMEA (L.) Mill., var. PHANEROLEPIS Fernald, RHODORA, xi. 203 (1909). With the typical form of the species, boggy barrens west of Goose Lake, Argyle.

THUJA OCCIDENTALIS L. To the rather few stations for White Cedar in Nova Scotia should be added Cedar Lake, Digby and Yarmouth Cos. (near Port Maitland). It is doubtless also at Cedar Lake, east of Corberrie. See pp. 100, 102.

JUNIPERUS COMMUNIS L., var. DEPRESSA Pursh. In Nova Scotia

as on Prince Edward Island as often in wet boggy barrens as on drier habitats.

J. HORIZONTALIS Moench. *J. sabina*, var. *procumbens* Pursh. Although stated by Macoun to be "abundant on exposed slopes and river banks from Anticosti, Nova Scotia, New Brunswick" westward, this species was not once met by our party in the southwestern counties. It is on headlands of the Bay of Fundy and Northumberland Strait and on Sable Island and Cape Breton.

SPARGANIUM AMERICANUM Nutt. Common throughout the province, passing freely to var. ANDROCLADUM (Engelm.) Fernald & Eames. See p. 142.

S. DIVERSIFOLIUM Graebn. Apparently common thoughout the province.

S. DIVERSIFOLIUM, var. ACAULE (Beeby) Fernald & Eames. Frequent.

S. FLUCTUANS (Morong) Robinson. Deep water of Trefry's Lake, Arcadia, Yarmouth Co. See p. 145.

*S. MINIMUM Fries. Apparently local: quiet pools in Little River east of Tiddville, Digby Co. Previously collected by Nichols in a brook, mountains west of Ingonish, Victoria Co.

POTAMOGETON NATANS L. Frequent from Digby Neck to Cape Breton.

*P. OAKESIANUS Robbins. Frequent in shallow peat- or sand-bottomed lakes and pools of Digby and Yarmouth Cos. See pp. 146, 148, 163. Formerly collected at margin of Taylor's Lake, Sunny Brae, Pictou Co. (*H. St. John*, no. 1373).

P. ALPINUS Balbis. Seen by us only at Truro and Baddeck. See p. 164.

**P. PULCHER Tuckerm. Muddy cove in Lily Lake, Sandy Cove, Digby Co. See p. 164.

P. AMPLIFOLIUS Tuckerm. Abundant in Sloane Lake, Pleasant Valley, Yarmouth Co.

P. GRAMINEUS L., var. GRAMINIFOLIUS Fries. Nov. Fl. Suec. ed. 2, 36 (1828); Robbins in Gray, Man.ed. 5, 487 (1867); Freyer, Journ. Bot. xxx. 33, tt. 317, 318 (1892). *P. gramineus*, proles α. *graminifolius* (Fries) Aschers. & Graebn. in Engler, Pflanzenr. iv. Fam. 11: 86 (1907). *P. gramineus*, β. *gramineus* Laestad. Vet. Acad. Handl. (1825) 152, acc. to Fries., not *P. gramineum*[*us*] L. Sp. Pl. i. 127. (1753) which, according to Freyer (Pot. Brit. Isl. 65), is *P. heterophyllus* Schreb. *P. gramineus*, var. (?) *myriophyllus* Robbins in Gray, Man. ed. 5, 487 (1867). *P. heterophyllus*, var, *graminifolius* (Fries) Wats. & Coult. in Gray, Man. ed. 6, 561 (1890). *P. heterophyllus* of most recent American authors, not Schreb. *P. graminifolius* (Fries) Freyer, Pot. Brit. Isl. 64, t. 36 (1915).—Ponds, pools, and streams, frequent.

There has always been confusion as to the identity of the common

and highly variable American plant which is here called *P. gramineus*, var. *graminifolius*. In Freyer's *Potamogetons of the British Isles* typical *P. gramineus* L. (= *P. heterophyllus* Schreb.) is figured and described as having the upper stipules strongly divergent and the short peduncles conspicuously thickened at summit, while *P. graminifolius* is illustrated with more appressed-ascending stipules and elongate barely club-shaped peduncles. All American material in the Gray Herbarium and the herbarium of the New England Botanical Club, altogether about 300 sheets, agrees with *P. graminifolius* in these characters, and typical *P. gramineus* or *P. heterophyllus* is rare if not quite unknown in North America. Freyer indicates differences in the fruit, although it is significant that in his description he was obliged to quote from Morong the supposed distinctive characters of the fruit of *P. graminifolius*. These differences, however, do not appear constant and it is noteworthy that many American plants, otherwise good *P. graminifolius* as treated by Freyer, have the fruits quite like his illustrations under *P. gramineus*. It seems best, therefore, to consider *P. graminifolius* a strong variety of the complex *P. gramineus*, as has been so generally the practice for a full century by students of the Pondweeds.

** P. GRAMINEUS, var. SPATHULAEFORMIS Robbins in Gray, Man. ed. 5, 487 (1867). *P. spathaeformis* Tuckerm. ex Robbins, l. c. (1867); Bennett, Journ. Bot. xxxviii. 130 (1900); Fernald, RHODORA, viii. 224 (1906); Robinson & Fernald in Gray, Man. ed. 7, 74 (1908). *P. varians* Morong ex Freyer, Journ. Bot. xxv. 308 (1887), xxvii. 33, t. 287 (1889); Freyer, Pot. Brit. Isl. 67, t. 41 (1915). *P. spathulaeformis* (Robbins) Morong, Mem. Torr. Bot. Cl. iii. pt. 2: 26 (1893), but hardly t. 35 (with attenuate and therefore quite uncharacteristic submersed leaves). *P. Zizii* × *gramineus* Aschers. & Graebn. Synop. Mitteleur. Fl. i. 327, in part (1897). *P. spathuliformis* Asch. & Graebn. in Engler, Pflanzenr. iv. Fam. 11:91 (1907).—Apparently local, collected only once in DIGBY Co.: brook with muddy bottom, outlet of Midway (Centreville) Lake.

Var. *spathulaeformis* was proposed by Robbins with doubt as to its exact affinity because his material from Mystic Pond in Middlesex Co., Massachusetts, was sterile. Newfoundland material from two stations closely matches the original Mystic Pond collections and the material from Grand Falls, Newfoundland (*Fernald & Wiegand*, no. 4475) might well have formed the basis of the plate of *P. varians* in Freyer's *Potamogetons of the British Isles*. Both New-

foundland collections are sparingly fruiting, while the Nova Scotia plant is sterile, but exactly similar material from the Magdalen Islands as well as from southern Maine has good fruit which is quite like that of var. *graminifolius*. In fact, a large series of specimens of var. *spathulaeformis* (from Newfoundland, Anticosti Island, the Magdalen Islands, Nova Scotia, Maine, Massachusetts and Connecticut) seems to be separable from var. *graminifolius* only by its round-tipped or decidedly obtuse submersed leaves. It has been generally surmised that *P. spathaeformis* or *P. varians* is a hybrid of *P. gramineus* or its var. *graminifolius* with *P. angustifolius* Berchtold & Presl; but since the latter species is unknown northeast of Massachusetts, while the supposed hybrid extends as a fertile plant to eastern Newfoundland, its hybrid nature is certainly extremely doubtful. Furthermore, the fertile obtuse-leaved plant of Newfoundland, the Magdalen Islands and Maine has the characteristic small fruit of *P. gramineus* and its var. *graminifolius*.

P. BUPLEUROIDES Fernald. Frequent in brackish waters. Rare in fresh water: seen only in Midway (Centreville) Lake, Centreville, Digby Co. See p. 163.

The characters originally pointed out seem consistently to distinguish *P. bupleuroides* from the European and northern *P. perfoliatus* L. — the less puckered leaf, fewer nerves, slender stem, almost filiform peduncle without much spongy thickening, and smaller, firm and olive-brown fruit. Dr. St. John and I have reviewed the material and find no specimens to match old world *P. perfoliatus* from south of Labrador.

* P. FRIESII Rupr. Seen only in COLCHESTER and CUMBERLAND COS.: quiet waters of Salmon River, Truro; spring-pools and ditches south of Amherst.

* P. CONFERVOIDES Reichenb. Deep or shallow water of lakes, small ponds and bog-pools, frequent in YARMOUTH CO.: deep water of Trefry's Lake, Arcadia; peaty and muddy pond-hole near head of St. John Lake, Springhaven; water-holes in sphagnous bog by the station, Argyle; drifted ashore from deep water of Great Pubnico Lake. See pp. 145, 149.

* P. DIMORPHUS Raf. Shallow water on tidal flats of Tusket River, Tusket Falls, Yarmouth Co.

* P. FILIFORMIS, var. BOREALIS (Raf.) St. John, RHODORA, xviii. 134 (1916). Fresh to brackish swale at head of Baddeck Bay, Baddeck.

* P. VAGINATUS Turcz. Bull. Soc. Nat. Moscou, xi. 102 (1838); St. John, RHODORA, xx. 191 (1918). *P. moniliformis* St. John,

Rhodora, xviii. 130 (1916). Cold, shallow brook in woods at head of Baddeck Bay, Baddeck. See p. 164.

P. pectinatus L. Brackish or salt water at various stations from Yarmouth Co. to Cape Breton. See p. 141.

Ruppia maritima L., var. longipes Hagström, Botaniska Notiser (1911) 138; Fernald & Wiegand, Rhodora, xvi. 125 (1914). Brackish water at various points throughout the province. See p. 141.

R. maritima, var. rostrata Agardh in Physiogr. Sällsk. Arsbetr. 6 Maj (1823) 37; Fernald & Wiegand, l. c. Brackish pools in the marshes below Truro.

Zannichellia palustris L., var. major (Boenningh.) Koch. See p. 110. Apparently frequent in brackish or saline waters or on saline mud.

*Zostera marina L., var. stenophylla Aschers. & Graebn. This very slender extreme of the species abounds in Great Bras d'Or Lake in the gravel about Kidstone Island.

Najas flexilis (Willd.) Rostk. & Schmidt. Not seen in Yarmouth, Shelburne and Queens Cos. Occasional elsewhere. See p. 146.

Triglochin palustris L. Characteristic of the fresh to brackish springy inner borders of salt marshes or on brackish sand-flats, throughout. Also in open peaty spots in a spring-fed bog south of Amherst.

*Sagittaria cuneata Sheldon. *S. arifolia* Nutt. Probably somewhat general in the argillaceous regions. Hants Co.: pond-hole near Five-mile River. Cumberland Co.: spring-pools and ditches south of Amherst. See pp. 131, 137.

S. graminea Michx. Margins of ponds and on fresh tidal mud at various stations from Yarmouth Co. to Cape Breton. See p. 146.

**Panicum dichotomiflorum Michx. Seen only in the Tusket Valley, Yarmouth Co.: sandy and gravelly shores and borders of savannahs, Tusket (Vaughan) Lake and Butler's (Gavelton) L., Gavelton. See p. 166.

**P. capillare* L., var. *occidentale* Rydb. See Rhodora, xxi. 111 (1919). Seen only about railroad yards; obviously introduced.

**P. virgatum L., var. cubense of many authors, not Griseb. Gravelly beaches or peaty borders of lakes of Yarmouth Co.: Salmon (Greenville) Lake; St John L., Springhaven; Butler's (Gavelton) L., Gavelton; Great Pubnico L. See p. 156.

P. longifolium Torr., var **tusketense, n. var., planta dense cespitosa 2–7 dm. alta; foliis 3–6 mm. latis glabris; paniculis coarctatis 0.3–1.5 dm. longis ramis plerumque valde adscendentibus; spiculis 2.7–3.4 mm. longis; gluma superiore lemma sterile non aequante caryopsibus ellipsoideis obtusis 1.6–1.8 mm. longis 0.8–0.9 mm latis.

Densely cespitose, 2–7 dm. high: leaves 3–6 mm. wide, glabrous:

panicles contracted, 0.3–1.5 dm. long, mostly with strongly ascending branches: spikelets 2.7–3.4 mm. long; upper glume shorter than the sterile lemma: caryopsis ellipsoid, obtuse, 1.6–1.8 mm. long, 0.8–0.9 mm. wide.—Valley of the Tusket River, Nova Scotia: gravelly margin (northwest side) of Tusket (Vaughan) Lake, August 20, 1920, *Fernald, Bissell, Graves, Long* & *Linder*, no. 19,759; sandy and gravelly beach of Butler's (Gavelton) Lake, Gavelton, September 4, 1920, *Fernald, Long* & *Linder*, no. 19,763; wet peaty margin of Butler's Lake, Gavelton, September 4, *Fernald, Long* & *Linder*, no. 19,764 (type in Gray Herb.); wet peaty shore, East Branch of Tusket River, Gavelton, September 4, *Fernald, Long* & *Linder*, no. 19,765; sandy and gravelly margin of Pearl Lake, Kemptville, October 7, 1920, *Fernald* & *Linder*, no. 19,761; peaty margin of Kegeshook Lake, October 8, 1920, *Fernald* & *Linder*, no. 19,762. See pp. 160, 168.

Differing from typical *P. longifolium* as it occurs from Texas and Florida to New Jersey in its low stature, glabrous and rather broader leaves, very contracted and short panicle, longer spikelets, short upper glume and broad and bluntish grain; the southern plant being mostly 6–8 dm. high, with the usually pilose-based leaves 2–5 mm. wide, the panicle 1–2.5 dm. long and with loosely ascending branches, the spikelets 2.4–2.7 mm. long, the upper glume equaling or longer than the lemma and the slender and acute grain 0.4–0.7 mm. wide. If the material from the South alone were accessible for comparison the Nova Scotian plant would seem a distinct species; but some specimens from New Jersey, Connecticut and Rhode Island show spikelets up to 3 mm. long and grains quite as broad as in the Nova Scotian material, but with the elongate glume and looser panicle of the southern plant; while specimens from Lake Werden, Rhode Island, have the panicle as contracted as in the Tusket Valley plant.

P. depauperatum Muhl., var. **psilophyllum**, n. var., foliis utrinque glabris vel vaginis sparsissime setulosis.

Leaves wholly glabrous or the sheaths very sparsely setulose. Nova Scotia to Megantic Co., Quebec, Wisconsin and Virginia. Type: extremely sterile land, Canton, Maine, July 7, 1906, *J. C. Parlin*, no. 1957 (Gray Herb.). In Nova Scotia known only from Queens, Annapolis and Kings Cos. Macoun records it from Kingston. We collected it in a sandy and gravelly railroad yard at Middleton (Annapolis) and in gravelly soil near the mouth of Broad River (Queens).

The characteristic plant about Middleton, in the undisturbed soil of the dry plains and open woods, completely lacks the large primary panicles on elongate culms and bears only reduced basal panicles of 1–4 spikelets. This extreme form may be called

** P. DEPAUPERATUM, var. PSILOPHYLLUM, forma **cryptostachys**, n. f., paniculis omnino reductis basilaribus, spiculis 1–4.—NOVA SCOTIA: dryish open sandy plains, Middleton, July 20, 1920, *Fernald, Pease* & *Long*, no. 19,769 (TYPE in Gray Herb.); dry sandy thickets and borders of woods, Middleton, July 21, *Fernald* & *Pease*, no. 19,770. See p. 138.

Var. *psilophyllum* is the common plant with sheaths sparsely pilose or quite glabrous. This extreme and the plant with copiously pilose sheaths were both included by Muhlenberg in his *P. depauperatum* but by Hitchcock & Chase "a specimen with pilose sheaths . . . has been chosen as the type." Whereas var. *psilophyllum* is the dominant plant of the North, the more pilose extreme is commoner in the southern and central states. Thus, of the 173 sheets of specimens examined from Nova Scotia, Quebec and New England, 152 are var. *psilophyllum* and only 21 the plant with copiously pilose sheaths. Conversely, all the material examined from North Carolina, and Georgia to Arkansas, Missouri and Illinois is typical *P. depauperatum*.[1]

Recently Mr. F. T. Hubbard (RHODORA, xiv. 169) has taken up the name *P. strictum* Pursh (1814) to displace *P. depauperatum* Muhl. (1817) in spite of the earlier *P. strictum* R. Br. (1810); Hubbard citing as a basis for his change Articles 37 and 50 of the International Rules. But the application of Art. 37 (rejecting names published without diagnoses or merely cited in synonymy) is not apparent, for Robert Brown published *P. strictum* as a valid species with careful description. Art. 50 was applied by Hubbard to the case of *P. strictum* Pursh through an obvious misapprehension, for, although *P. strictum* R. Br. is treated in *Index Kewensis* as a synonym of *P. marginatum*, it is not so treated by those who know the plants; Bentham, F. M. Bailey and other students of the Australian flora all maintaining it as at least a good variety, which rests directly

[1] In its greater abundance northward *P. depauperatum*, var. *psilophyllum* is comparable with

P. LINEARIFOLIUM Scribn., var. **Werneri** (Scribn.), n. comb. *P. Werneri* Scribn. in Britton & Brown, Ill. Fl. iii. 501, fig. 268b (1898).

Typical *P. linearifolium* has copiously pilose sheaths, var. *Werneri* glabrous sheaths. The very minute difference in spikelets relied upon by Hitchcock & Chase is very inconstant and wholly unsatisfactory and the only usable distinction is in the sheath. Of 103 sheets examined from Quebec and northern and central New England 76 are var. *Werneri*, 27 the typical form of *P. linearifolium*. Conversely, of 28 sheets examined from Missouri 26 are typical *P. linearifolium* and only 2 var. *Werneri*.

upon *P. strictum* R. Br. The general recognition of *P. strictum* R. Br. as the nomenclatorial basis of a variety does not, as Hubbard seems to infer, render that name "an earlier homonym which is universally regarded as nonvalid" (Art. 50).

P. BOREALE Nash. Abundant in damp or dryish situations throughout the province.

** P. SPRETUM Schultes. Boggy savannahs and peaty, sandy or gravelly upper borders of lake-beaches, eastward to Halifax Co.; sixteen collections from the following stations. DIGBY Co.: Cedar Lake. YARMOUTH Co.: Cedar L.; Beaver L.; Porcupine L., Arcadia; large lake north of Saller L., Kemptville; Fanning L., Carleton; Tusket (Vaughan) L.; Butler's (Gavelton) L., Gavelton; St. John L., Springhaven; Kegeshook L.; Sand, Pond Argyle; Great Pubnico L. HALIFAX Co.: Shubenacadie Grand Lake. See pp. 99, 101, 102, 141.

(To be continued.)

THE GRAY HERBARIUM EXPEDITION TO NOVA SCOTIA, 1920.

M. L. Fernald.

(*Continued from p. 195.*)

Panicum Lindheimeri Nash. As already noted (p. 141) there is no constant character by which to distinguish from *P. Lindheimeri* the several plants subsequently published as species and separated by Hitchcock & Chase upon the minutest differences in size of spikelets and varying degrees of pubescence on the foliage. These plants, *P. tennesseense* Ashe, *P. huachucae* Ashe, and *P. implicatum* Scribner, have for a quarter-century baffled those who, not restricting their studies to the grasses, are in the habit of looking in other plants for essentially constant characters in species and who have long since learned that, in other groups at least, fluctuating degrees of the same type of pubescence when unaccompanied by definite characters of the inflorescence give very unsatisfactory grounds for specific separa-

tion. More recently, further perplexity has been added to the group for those who are not intensive specialists on *Panicum* by the publication of *P. languidum* Hitchc. & Chase. The type collection was a clump growing in dry woods at South Berwick, Maine, with spikelets unusually large (1.8–2.1 mm. long) but otherwise not different from lax shade-forms of *P. huachucae*, the individuals of rich or shaded habitats separated by Hitchcock & Chase as *P. huachucae*, var. *silvicola*. The authors of *P. languidum* cite five collections: South Berwick, Maine, *Fernald, Parlin* (from the same clump); Island Falls, Maine, *Fernald;* Mt. Desert Island, *Fernald;* Ashburnham, Massachusetts, *Harris;* and Platte Clove, New York, *Williamson*.

I have not seen the New York material, but the South Berwick clump was broken into several full-sized sheets, three of which are before me. Their spikelets range from 1.8–2.1 mm. long (not merely 2 mm. as originally described) and the panicle is, as described by Hitchcock & Chase, "loosely flowered, the very flexuous branches finally spreading or drooping . . . the axis and branches sparsely long-pilose." The inflorescence is thus like the theoretical inflorescence of *P. implicatum* but looser and with longer spikelets or quite like that of many specimens determined by Hitchcock & Chase as *P. huachucae*, var. *silvicola*, a plant which they describe as having spikelets 1.6–1.8 mm. long. The leaves of the South Berwick material are inseparable from those of the latter plant. The other Maine specimens of *P. languidum* are like the type as are more recent collections from Massachusetts, but the Harris collection from Ashburnham, included with the original *P. languidum*, is quite different, having narrowly ellipsoid panicles with strongly spreading-ascending branches, the axis smooth and the sheaths pilose with ascending (not wide-spreading) hairs. This collection is represented by three sheets, thoroughly uniform and clearly a shade-state of *P. subvillosum* Ashe. With the latter species eliminated from the complex, *P. languidum* is left as a series of specimens which in every character merge directly into *P. huachucae*.

The original of *P. Lindheimeri* was a plant with the axis of the panicle glabrous and with the lower internodes and sheaths papillose-hirsute, the upper glabrous, and Hitchcock & Chase place it in their section *Spreta* because it has "Sheaths glabrous or only the lowermost sometimes pubescent." *P. huachucae*, on the other hand, and

P. tennesseense are placed in the section *Lanuginosa* with "Sheaths strongly pubescent." The spikelet-measurements as given by them are: *P. Lindheimeri*, 1.4–1.6 mm. long; *P. huachucae* 1.6–1.8 mm. and *P. tennesseense*, 1.6–1.7 mm. The last, although placed in a group with "Sheaths strongly pubescent," is described as having "sheaths . . . rarely nearly glabrous," while in the "glabrous" *P. Lindheimeri* "sometimes the pubescence extends nearly to the summit. These more pubescent specimens . . . resemble less pubescent specimens of *P. tennesseense* but can be distinguished by the smaller spikelets." If the difference between the extremes of the spikelets were positive, the latter assurance would carry conviction; but when, measuring the spikelets of specimens labelled (and often cited) by Hitchcock & Chase as *P. tennesseense*, it is found that several sheets (Framingham, Mass., *E. C. Smith;* Providence, R. I., *Collins;* East Hartford, Conn., *Driggs;* Washington, D. C., *Steele;* Monteer, Mo., *Bush;* etc.) show mature spikelets only 1.4–1.6 mm. long, while this minimum is exhibited by a sheet specially collected by Mrs. Chase and distributed to show true *P. tennesseense* (Am. Gr. Nat. Herb. no. 127); — when we find that *P. tennesseense* may have spikelets as small as in *P. Lindheimeri*, the effort to separate the two as species becomes futile. This futility is further emphasized by the plant of Yarmouth County, Nova Scotia, in habit so closely similar to the type-number of *P. Lindheimeri* as at first to seem identical with it, but with spikelets even larger than in *P. tennesseense*, 1.8–2 mm. long.

Panicum tennesseense, itself, as treated by Hitchcock & Chase, consists of two rather definite trends. Of the material in the Gray Herbarium and the herbarium of the New England Botanical Club so named by them 18 sheets have panicles with the lower internodes pilose as in *P. huachucae*, var. *silvicola*, which likewise has spikelets of the same size; while 25 have the axis of the panicle glabrous as in *P. Lindheimeri*. Some sheets of the latter plant from the St. John valley in northern Maine have been labeled by them *P. Lindheimeri;* others of the same plant, *P. tennesseense*. One sheet from Massachusetts (*Hubbard*, no. 205) with the characteristic panicle, long spikelets and pilose axis of *P. languidum* was determined by Mrs. Chase in 1911 as the latter species, but, naturally enough, in 1912 she changed the determination to *P. tennesseense;* naturally enough because, as the preceding discussion indicates, those species are merely phases of one polymorphous species, *P. Lindheimeri*.

Similarly with *P. huachucae* and *P. implicatum*, the lines between these and the others are vague, Hitchcock & Chase saying in a note upon the shade-state of the former (*P. huachucae*, var. *silvicola*), "The following specimens represent an extreme form with the upper surface of the blades nearly or quite glabrous, thus approaching *P. tennesseense*." Then follows an enumeration of 19 specimens to which the more recent collections would surely add many more, but the citation of 19 confessed intermediates is sufficient indication of the weakness of the species. *P. implicatum* is the extreme of the series with longest pubescence on the leaves, in its best development well pronounced but, to quote Hitchcock & Chase's apt phrase: "More robust specimens of *P. implicatum* approach *P. huachucae*." In New England and eastern Canada the distinctions between the two are most unsatisfactory and at best *P. implicatum* seems to be of varietal rank, as Scribner, who first published it as a species in 1898, regarded it in 1901.

Others, like *P. pacificum* Hitch. & Chase, seem hardly separable as species. *P. pacificum* has spikelets tending to be minutely larger than in *P. huachucae;* and its authors reason that, although "It most nearly resembles *P. huachucae*," it cannot be included in that species because of "a distinct range." The type of *P. huachucae* came from Huachuca Mts., Arizona, and Hitchcock & Chase cite material from San Bernardino Mts., California, while they allow *P. pacificum* to occur also in the San Bernardino Mts. and to extend eastward into Arizona. The ranges of the two are thus overlapping, the habit, foliage and pubescence identical, and the spikelets with overlapping measurements.

The variations above discussed seem better treated as a series of varieties of one wide-ranging and polymorphous species, as follows:

Axis of panicle glabrous or at most with few appressed hairs: leaf-blades glabrous or very sparsely pilose and glabrate above, glabrous or minuetly pubescent beneath; upper sheaths glabrous to somewhat pilose.
- Spikelets 1.3-1.6 mm. long ..... Var. *typicum*.
- Spikelets mostly 1.6-2 mm. long ..... Var. *septentrionale*.

Axis of panicle spreading-pilose, at least on the lower internodes: leaf-blades pilose to glabrous above, commonly pubescent beneath; upper sheaths mostly pilose.
- Spikelets mostly 1.6-2.1 mm. long: leaf-blades closely short-pilose, sparsely long-pilose or glabrous above. Var. *fasciculatum*.
- Spikelets mostly 1.3-1.5 mm. long: leaf-blades long-pilose above, with hairs mostly 3-6 mm. long ..... Var. *implicatum*

P. Lindheimeri Nash, var. **typicum**. *P. Lindheimeri* Nash, Bull. Torr. Bot. Cl. xxiv. 196 (1897); Hitchcock & Chase, Contrib. U. S. Nat. Herb. xv. 203 (1910). *P. Funstoni* Scribn. & Merr. U. S. Dept. Agr. Div. Agrost. Circ. xxxv. 4 (1901).—California to Florida, north to Minnesota, southern Ontario and New England.

** Var. **septentrionale**, n. var. Planta laxe vel dense cespitosa 2–7 dm. alta; vaginis glabris vel plus minusve pilosis pilis divergentibus, laminis firmis utrinque glabris vel sparse breviterque pilosis; paniculis primariis ovoideis 2.5–7 cm. longis rhachi glabro; spiculis plerumque 1.6–2 mm. longis.—Nova Scotia and New Brunswick to Manitoba, south to Connecticut, New York, Indiana and Missouri. The following are representative of a series of about 100 sheets studied. Nova Scotia: wet sphagnous swale at border of Beaver Lake, Yarmouth Co., July 25, 1920, *Long* & *Linder*, no. 19,805, October 6, 1920, *Fernald* & *Linder*, no. 19,814 (unusually tall and little tufted from growing in a dense swale). New Brunswick: river-gravels and shingly border of thicket by the St. John River, Woodstock, July 14, 1916, *Fernald* & *Long*, no. 12,527 (type in Gray Herb.); recent clearing, Ingleside, Westfield, August 7, 1909, *Fernald*, no. 1255; gravelly shore of the basin, Gorge of the Aroostook River, *Fernald*, no. 1250. Maine: St. John River at mouth of Little Black River, July 27, 1900, *Collins* & *Williams;* gravelly shores of St. John River, St. Francis, August 5, 1893, *Fernald*, no. 166a; Fort Kent, August 1, 1900, *Collins* & *Williams;* river-thicket, Fort Fairfield, August 10, 1909, *Fernald*, no. 1257; sandy river-bank (Penobscot River), Bradley, September 16, 1897, *Fernald;* sandy clearings and pastures, Fairfield, July 24, 1916, *Fernald* & *Long*, no. 12,751; dry wooded slope of Mt. Megunticook, Camden, August 13, 1913, *Fernald;* in sand, Canton, July 7, 1906, *Parlin*, no. 1958; edge of cliff, Ogunquit, Wells, July 15, 1903, *Parlin*, no. 1577. New Hampshire: sandy pasture, Shelburne, July 21, 1913, *Deane;* roadside, Stewartstown, July 19, 1917, *Fernald* & *Pease*, no. 16,826; railroad track, Stratford, July 18, 1917, *Fernald* & *Pease*, no. 16,810; dry soil, Northumberland, *Fernald* & *Pease*, no. 16,811; gravelly bank of Pemigewasset River, North Woodstock, July 7, 1915, *Fernald*, no. 11,515; sandy river-terraces above Plymouth, July 30, 1915, *Fernald*, no. 11,516; Nashua, June 24, 1903, *Robinson*, no. 789. Vermont: Willoughby Mt., Westmore, *Horace Mann et al.* (axis slightly pubescent, approaching that of var. *fasciculatum*). Massachusetts: gravel, Manchester, July 15, 1913, *Hubbard*, no. 655; Holbrook, June 18, 1899, *Greenman*, no. 3133; Rehoboth, June 22, 1914, *Forbes;* sand-plain, Springfield, June 8, 1913, *Fernald*, no. 8650; woodroad near Shaw Pond, Becket, July 28, 1916, *Hoffmann;* rocky roadside, Mt. Washington, August 11, 1914, *Hoffmann;* wet sandy roadside, Stockbridge, June 20, 1914, *Hoffmann;* dry clearings and open woods on sericite schist, near summit of Serpentine Ledge, Florida, June 24, 1913, *Fernald* & *Long*, no. 8620. Rhode Island: sterile meadow

Warwick, June 25, 1910, *Fernald*. Connecticut: sandy soil, South Windsor, June 23, 1916, *Driggs;* dry soil, Manchester, July 9, 1904, *Driggs*, no. 2927; wet meadow, Southington, July 13, 1901, *Andrews;* moist roadside, Danbury, July 19–20, 1912, *Harger*. New York: bank of St. Regis River, Stockholm, July 1, 1916, *O. P. Phelps*, no. 1450; swamp, Norfolk, June 30, 1915, *Phelps*, nos. 1100, 1101; dry rocks, Murray Island, Jefferson Co., July 4, 1902, *Robinson* & *Maxon*, no. 86; sandy fields, Albany, June 10, 1918, *House;* dry gravel, Ulysses, July 22, 1913, *Wiegand* & *Palmer*, no. 89. Ontario: Cache Lake, Algonquin Park, June 20, 1900, *Macoun*, no. 72,965 in part (mixed with *P. boreale*); Toronto, June 7, 1911, *J. White*, no. 8. Indiana: sand ridges, Roby, September 2, 1907, *Lansing*, no. 2687; swale, Edgemoor, July 24, 1906, *Lansing*, no. 2606; sand ridges, East Chicago, August 10, 1910, *Lansing*, no. 2801. Manitoba: Lake Winnipeg Valley, 1857, *Bourgeau*. Minnesota: moist sand, Hubert, July 25, 1913, *Bergman*, no. 2879. Missouri: barrens, Monteer, May 24, 1907, *Bush*, no. 4684.

Var. **fasciculatum** (Torr.), n. comb. *P. dichotomum*, β. *fasciculatum* Torr. Fl. No. and Mid. U. S. 145 (1824). *P. nitidum* α. *ciliatum* and δ. *pilosum* Torr. l. c. 146 (1824). *P. huachucae* Ashe, Journ. Elisha Mitchell Soc. xv. 51 (1898). *P. tennesseense* Ashe, l. c. 52 (1898). *P. unciphyllum*, forma *prostratum* Scribn. & Merr. Rhodora, iii. 124 (1901). *P. lanuginosum*, var. *huachucae* (Ashe) Hitchc. Rhodora, viii. 208 (1906). *P. huachucae*, var. *silvicola* Hitchc. & Chase in Robinson, Rhodora, x. 64 (1908). *P. pacificum* Hitchc. & Chase, Contrib. U. S. Nat. Herb. xv. 229 (1910). *P. languidum* Hitchc. & Chase, l. c., 232 (1910). *P. huachucae*, var. *fasciculatum* (Torr.) Hubbard, Rhodora, xiv. 171 (1912).—Southern California to Florida, north to southern British Columbia, Idaho, Montana, South Dakota, Minnesota, Ontario, Quebec and Newfoundland.

In its typical form the variety has loosely spreading leaves. *P. huachucae* is a trivial form, of more open habitats and therefore with stiffer and more ascending foliage. *P. unciphyllum*, forma *prostratum* (basis of *P. languidum*) is a shade form with tendency to looser inflorescences and slightly longer spikelets.

In Nova Scotia var. *fasciculatum* is common from Yarmouth to Sable Island and Pictou Co.

Var. **implicatum** (Scribn.), n. comb. *P. implicatum* Scribn. U. S. Dept. Agric. Div. Agrost. Bull. 11: 43. fig. 2 (1898). *P. unciphyllum implicatum* Scribn. & Merrill, Rhodora, iii. 123 (1901).—Newfoundland to southern New York, west to Ontario, Wisconsin and Iowa.

Common in western Nova Scotia, often too close to the last.

P. subvillosum Ashe. Common on dry sandy or rocky open soil throughout the silicious regions from Yarmouth Co. to Halifax and Cumberland Cos., thence on into eastern New Brunswick and Prince Edward Island. See p. 103.

* *Setaria viridis* (L.) Beauv., var. *Weinmanni* (R. & S.) Brand; Fernald & Wiegand, Rhodora, xii. 133 (1910). This easily recognized variety, now widely dispersed as a weed in eastern Canada, occurs in the railroad yard at North Sydney and presumably elsewhere.

** Leersia oryzoides (L.) Sw., forma clandestina E. H. Eames, Rhodora, xviii. 239 (1916). This form seems to be more common in Nova Scotia than the typical form of the species with exserted panicles. In all our Nova Scotian collections of both forms the spikelets are unusually long, 5–6 mm.

** L. oryzoides, forma glabra A. A. Eaton, Rhodora, v. 118 (1903). In New England this form is characteristic of tidal flats, but in Trefry's Lake, Arcadia (Yarmouth Co.) completely submersed colonies had the sheaths essentially as smooth as in Eaton's original material, thus suggesting that the smoothness is a result of submergence.

Milium effusum L. To the Cape Breton record should be added Hants Co.: alluvium of Five-Mile River. See pp. 136, 170.

* Oryzopsis canadensis (Poir.) Torr. *Stipa canadensis* Poir. Dry open barrens, Springhill Junction (Cumberland Co.); thence northward into New Brunswick and eastward to Prince Edward Island and Newfoundland. See p. 132.

O. asperifolia Michx. Common on peaty or sterile woodland soil, throughout.

Muhlenbergia racemosa (Michx.) B. S. P. Common in peaty swales and savannahs, apparently throughout.

Alopecurus geniculatus L. Recorded by Macoun only from Halifax, but common in ditches and shallow pools near towns in Yarmouth and Shelburne Cos.; also Baddeck. See p. 95.

** *A. geniculatus*, var. *microstachyus* Uechtr. in Fiek, Fl. von Schlesien, 500 (1881). This variety with small panicles (mostly 1–2 cm. long) is abundant in some roadside ditches at Yarmouth.

A. aristulatus Michx. *A. geniculatus*, var. *aristulatus* (Michx.) Torr. Cumberland Co.: spring-pools and ditches south of Amherst.

* Sporobolus uniflorus (Muhl.) Scribn. Not recorded in Macoun's *Catalogue* from Canada. Common in peat and wet sand from Yarmouth Co. eastward at least to Annapolis and Shelburne Cos.; also in Newfoundland. Recently collected about Georgian Bay, Ontario,—see J. M. Macoun, Ottawa Nat. xxiii. 192 (1910).

** Agrostis hyemalis (Walt.) B.S.P., var. **elata** (Pursh), n. comb. *Trichodium elatum* Pursh, Fl. Am. Sept. i. 61 (1814). *A. elata* (Pursh) Trin. Mém. Acad. St. Pétersb. sér. 6, vi. pt. 2, 317 (1841). *A. perennans elata* (Pursh) Hitchc. U. S. Dept. Agric. Bur. Pl. Ind. Bull. no. 68: 50 (1905). For discussion see p. 155.

Known northeast of Long Island and Nantucket only from barrens of Nova Scotia, the Magdalen Islands and Newfoundland. The

following specimens, many of them distributed as *A. hyemalis*, var. *geminata* (Trin.) Hitchc. into which var. *elata* seems to pass, are characteristic. Newfoundland: swampy woods, Bell Island, Conception Bay, *Howe & Lang*, no. 1302 (awned form with panicles 3 dm. long); serpentine tablelands, alt. 380 m., Bonne Bay, *Fernald* & *Wiegand*, no. 2514 (awned); open peat bogs, Birchy Cove (Curling), *Fernald & Wiegand*, no. 2513 (awned). Magdalen Islands: wet bogs among the sand ridges back of the Narrows, Alright Island, *Fernald, Long* & *St. John*, no. 6850 (awnless); dry open woods and clearings and sphagnous bog near Étang du Nord village, Grindstone I., *Fernald, Bartram, Long & St. John*, nos. 6847, 6848 (awnless); wet bogs and mossy pond-margins among sandhills between East Cape and East Point, Coffin I., *Fernald, Long*, & *St. John*, no. 6851 (awned); dunes de la Pointe-de-l'Est, Ile de la Grande-Entrée, *Marie-Victorin* & *Rolland-Germain*, no. 9018 (awnless); sur la Dune du Nord, Grand Étang, *Marie-Victorin* & *Rolland-Germain*, no. 9017; dry clearing, Brion Island, *St. John*, no. 1766 (awnless). Nova Scotia: Canso, *J. Fowler* (awned); Sable Island, *St. John*, nos. 1136, 1365 (awnless); springy sphagnous bog near mouth of Broad River, *Fernald* & *Bissell*, no. 19,913 (awnless); wet peaty sloughs in barrens, Lower Argyle, *Fernald, Bissell, Graves, Long* & *Linder*, no. 19,911 (awnless), swampy spruce woods, Belleville, *Long* & *Linder*, no. 19,900; sphagnous swale bordering Salmon (Greenville) Lake, Yarmouth Co., *Fernald, Bissell, Graves, Long* & *Linder*, no. 19,912 (awnless); dryish sphagnous swales and bogs by Harris's Lake, Tiddville, Digby Co., *Fernald* & *Long*, no. 19,914 (awnless).

* A. perennans (Walt.) Tuckerm. Common throughout, especially in woodlands and thickets and on banks of streams. Highly variable and perhaps more than a single species.

Calamagrostris Pickeringii Gray. Boggy barrens, Digby and Yarmouth Cos. to Queens. Less common than the next. Previously recorded only from Cape Breton. See p. 161.

Calamagrostis Pickeringii Gray, var. debilis (Kearney) Fernald & Wiegand, Rhodora, xv. 135 (1913). Common on sphagnous bogs and peaty barrens, Digby and Yarmouth Cos. to Queens. Previously unknown between Massachusetts and Cape Breton. See pp. 99, 148.

* C. neglecta (Ehrh.) Gaertn., Meyer & Scherb. Springy swales south of Amherst, thence common northward in eastern New Brunswick, Prince Edward Island and the Magdalen Islands. See p. 131.

Ammophila breviligulata Fernald, Rhodora, xxii. 71 (1920). Common throughout, on sandy shores and dunes.

* Sphenopholis pallens (Spreng.) Scribn. Talus and crevices of gypsum cliffs, Port Bevis (Victoria Co.) and Five-Mile River (Hants Co.). See pp. 164, 170.

* *Avena fatua* L. Waste places, Yarmouth. See p. 136.

* Danthonia compressa Aust. Dry thickets and borders of woods, Yarmouth to Annapolis and Halifax Cos.

In Nova Scotia as elsewhere *Danthonia* is amazingly variable and it is impossible to draw lines with the definiteness of current treatments. The plant here treated as *D. compressa* is a good match for Austin's original material and may so pass until the genus can be satisfactorily studied.

** SPARTINA ALTERNIFLORA Loisel., var. PILOSA (Merr.) Fernald, RHODORA, xviii. 179 (1916). Marshes along Sissiboo River, Weymouth.

** SIEGLINGIA DECUMBENS (L.) Bernh. Peaty or wet sandy soils, YARMOUTH Co.: Cedar Lake; Yarmouth; Lily Lake; Arcadia; Trefry's Lake; Tusket. Possibly indigenous, but growing in half-cultivated areas. See pp. 95, 143, 151.

DISTICHLIS SPICATA (L.) Greene. Borders of salt marshes. YARMOUTH Co.: Sand Beach. VICTORIA Co.: Baddeck Bay. Recorded by Nichols from northern Cape Breton. See p. 164.

** POA COSTATA Schumacher, Enum. Pl. Saell. i. 28 (1801). See pp. 133, 139, 164. Mossy woods and glades. ANNAPOLIS Co.: southern slope of North Mt., near Middleton. HANTS Co.: Truro. VICTORIA Co.: Port Bevis.

P. TRIVIALIS L. Spruce swamps and springy ditches, Yarmouth and Shelburne Cos., often seeming like an indigenous plant as it does on Cape Cod and in Newfoundland.

P. SALTUENSIS Fernald & Wiegand, RHODORA, xx. 122 (1918). To the Cape Breton stations cited in the original description should be added HANTS Co.: woods along Five-Mile River. CUMBERLAND Co.: swampy woods, Springhill Junction.

* GLYCERIA OBTUSA (Muhl.) Trin. Common in peaty swales and bogs of Yarmouth Co. and southern Digby Co.

G. LAXA Scribn. Common in swales and borders of spruce swamps, Digby and Yarmouth Cos. to Queens. Reported by Nichols from Cape Breton. Common on Prince Edward Island.

** G. GRANDIS Watson, forma **pallescens**, n. f., spiculis flavescentibus.

Spikelets yellowish.—NOVA SCOTIA: brooksides and wet meadows, Yarmouth, July 4, 1920, *Bissell, Pease, Long* & *Linder*, no. 20,026 (TYPE in Gray Herb.). MAINE: Dover, September 1, 1894, *Fernald*, no. 564; Greenvale, 1894, *Kate Furbish*.

* G. PALLIDA (Torr.) Trin. Boggy swales and savannahs of the Tusket River, Yarmouth Co. Previous records from Nova Scotia rest on the common G. FERNALDII (Hitchc.) St. John, RHODORA, xix. 76 (1917). See p. 166.

PUCCINELLIA MARITIMA (Huds.) Parl. Common on salt marshes and sea-strands from Shelburne and Yarmouth Cos. to Hants. See pp. 94, 102.

P. PAUPERCULA (Holm) Fernald & Weatherby, var. ALASKANA (Scribn. & Merrill) Fernald & Weatherby, RHODORA, xviii. 18 (1916). Common on saline shores throughout the province.

Festuca rubra L., var. glaucescens (Hegetschw. & Heer) Richter. Sand dunes, Villagedale (Shelburne). Recorded by St. John from Sable Island.

* *F. capillata* Lam. Dry open soil, Shelburne and Yarmouth Cos. to Cumberland Co. Perhaps indigenous.

F. nutans Spreng. Alluvial woods, Five-Mile River (Hants). The old record from Halifax needs verification as the species belongs in rich alluvium or limy woodlands. See pp. 136, 170.

Bromus secalinus L. Railroad gravel along Five-Mile River (Hants).

* *B. commutatus* Schrad. Common in waste ground and about wharves or railroad yards, Yarmouth to Weymouth.

* *B. inermis* Leyss. Waste ground near wharf, Yarmouth.

Agropyron pungens (Pers.) R. & S. Gravel beaches of Great Bras d'Or Lake, clearly passing into the next.

A. pungens, var. **acadiense** (Hubbard), n. comb. *A. acadiense* Hubbard, Rhodora, xix. 15 (1917). Collected at the original station, gravel beach of Great Bras d'Or, Grand Narrows; also beaches of Kidstone Island and saline shore near mouth of George River. See p. 165.

A. repens (L.) Beauv., var. pilosum Scribn., Bull. U. S. Div. Agrost. no. 4: 36 (1897). A characteristic indigenous variety of the coast of New England and eastern Canada. Seen at various stations on the coast of Yarmouth Co.

** A. caninum (L.) Beauv., forma glaucum Pease & Moore, Rhodora, xii. 71 (1910). Thicket at upper border of gravel beach of Great Bras d'Or, Kidstone Island (Victoria Co.).

* A. caninum, var. tenerum (Vasey) Pease & Moore, Rhodora, (1910). *A. tenerum* Vasey. Thickets bordering sea-beaches and borders of brackish marshes or on limy talus. Yarmouth Co.: beach of Eel Lake; marsh at head of Abram River. Shelburne Co.: Villagedale. Queens Co.: Port Mouton. Hants Co.: gypsum cliffs, Five-Mile River. Cape Breton Co.: Grand Narrows.

** Elymus virginicus L., var. hirsutiglumis (Scribn.) Hitchc. Barrier beach, Sand Beach (Yarmouth Co.). See p. 151.

E. arenarius L., var. villosus E. Meyer. Gravelly strands of Yarmouth and Shelburne Cos. See p. 99.

* Asperella hystrix (L.) Humb. *Hystrix patula* Moench. Alluvial woods along Five-Mile River (Hants). See pp. 136, 170.

** Cyperus dentatus Torr. Sandy and gravelly beaches of many lakes in Yarmouth Co. See p. 142.

* Eleocharis Robbinsii Oakes. Lake-margins and bog-pools. Digby Co.: Tiddville. Yarmouth Co.: Argyle; Great Pubnico Lake. Collected by Howe & Lang at Windsor Junction, Halifax Co. See pp. 99, 149, 162.

* E. olivacea Torr. Margin of pond-hole in the savannah along Little River, east of Tiddville, Digby Co. See p. 162.

E. OBTUSA (Willd.) Schultes. Seen in the southwestern counties only at Springhaven, Yarmouth Co. Frequent from Annapolis Co. eastward.

E. UNIGLUMIS Schultes. *E. palustris*, var. *glaucescens* of American authors. Brackish and saline shores, common.

** E. TUBERCULOSA (Michx.) R. & S., var. **pubnicoensis**, n. var., a forma typica differt squamis castaneis; setis perianthii laevibus; achaeniis superne evidenter constrictis pallide viridibus; tuberculo viridiscenti deltoideo-ovato vix inflato achaeniis minore.

Differing from the typical form in its castaneous scales: perianth-bristles smooth: achenes definitely constricted to a thick neck, pale green: tubercle greenish, deltoid-ovate, scarcely inflated, smaller than the achene.—NOVA SCOTIA: boggy savannah and sandy beach by Great Pubnico Lake, Yarmouth Co., September 6, 1920, *Fernald, Long & Linder*, nos. 20,163 (TYPE in Gray Herb.), 20,164. See pp. 167, 169.

In typical *E. tuberculosa* of the coastal plain the scales are paler, often whitish; the bristles barbed; the achene rarely with a definite neck and in maturity deeper colored or even olive and the whitish almost inflated tubercle closely sessile and usually as large as or larger than the achene.

** E. ROSTELLATA Torr. Saline or brackish marshes and swales of YARMOUTH CO.: Sand Beach, Chebogue, Tusket, Argyle. See pp. 103, 105, 110, 149.

SCIRPUS NANUS Spreng. Recorded by Macoun and by Nichols from Cape Breton, and by St. John from Sable Island. On several marshes of Digby and Yarmouth Cos.

* S. PAUCIFLORUS Lightf. Springy border of salt marsh at head of Baddeck Bay, Victoria Co. See p. 164.

S. CESPITOSUS L., var. CALLOSUS Bigel.; Fernald, RHODORA, xxiii. 24 (1921). Abundant on dryish peaty barrens of Digby, Yarmouth and Shelburne Cos. and on Cape Breton. Doubtless general on the Atlantic slope of the peninsula. See pp. 99, 148.

S. HUDSONIANUS (Michx.) Fernald. Frequent from Cape Breton to Digby Neck and Cumberland and Lunenburg Cos. See p. 131.

S. SUBTERMINALIS Torr. Sandy and peaty pools and lake-margins, Yarmouth Co. to Hants, and presumably general. Recorded by Macoun and by Nichols from northern Cape Breton. See p. 148.

S. RUFUS (Huds.) Schrad. Brackish or saline marsh, Sand Beach, Yarmouth Co. See p. 103. Recorded by Nichols from northern Cape Breton.

** S. OLNEYI Gray. Salt and brackish marshes and swales of YARMOUTH CO.: Sand Beach, Chebogue, Arcadia, Tusket, Eel Lake. See pp. 103, 110, 142.

S. VALIDUS Vahl. Brackish or calcareous pools, frequent throughout.

S. ACUTUS Muhl. *S. occidentalis* (Watson) Chase. Lake-margins, swales and brackish marshes, frequent throughout. See pp. 101, 110, 131.

*S. CAMPESTRIS Britton, var. FERNALDII (Bicknell) Bartlett. Salt marsh at head of Baddeck Bay. Frequent on the eastern coast of New Brunswick and on Prince Edward Island.

S. ATROVIRENS Muhl., var. GEORGIANUS (Harper) Fernald, RHODORA, xxiii. 134 (1921). Swales and damp thickets, occasional eastward to Halifax Co.

**S. CYPERINUS (L.) Kunth. Peaty and cobbly beach of a large lake north of Saller Lake, Kemptville (Yarmouth Co.). The common plant of Nova Scotia is var. PELIUS Fernald.

*S. PEDICELLATUS Fernald. Wooded bank of Sissiboo River, Weymouth.

*ERIOPHORUM ANGUSTIFOLIUM Roth, var. MAJUS Schultes. Boggy savannah bordering Great Pubnico Lake, Yarmouth Co. Typical E. ANGUSTIFOLIUM is very common throughout the province.

E. VIRIDI-CARINATUM (Engelm.) Fernald. Common on Cape Breton. Not seen west or southwest of Hants Co.

RYNCHOSPORA FUSCA (L.) Ait. Wet peaty and sandy bogs and shores, very common in Digby and Yarmouth Cos.; also Cape Breton.

*R. CAPITELLATA (Michx.) Vahl. See Blake, RHODORA, xx. 27 (1918). Frequent on lake-shores, savannahs and peaty openings in the western counties. YARMOUTH Co.: common in the Tusket Valley; Salmon (Greenville) Lake. QUEENS Co.: Port Mouton and Broad River. HALIFAX Co.: Shubenacadie Grand Lake. See p. 134.

**R. CAPITELLATA, var. DISCUTIENS (Clarke) Blake, l. c. 28 (1918). Local in YARMOUTH Co.: gravelly margin of Tusket (Vaughan) Lake; wet mossy brook-side by small pond near Argyle Head; sandy shore of Great Pubnico Lake. See pp. 149, 160.

CLADIUM MARISCOIDES (Muhl.) Torr., forma **congestum, n. f., inflorescentiis congestis radiis suppressis vel brevissimis, glomerulis plerumque e spiculis 15–30 compositis.

Inflorescences congested, the rays suppressed or very short; glomerules mostly with 15-30 spikelets.—NOVA SCOTIA: with the typical form of the species at peaty margin of Harris's Lake, Tiddville, Digby Co., August 22, 1920, *Fernald* & *Long*, no. 20,286 (TYPE in Gray Herb.).

CAREX SCOPARIA Schkuhr, forma **peracuta, n. f., spicis approximatis anguste rhomboideis apice valde attenuatis vel subcaudatis.

Spikes approximate, narrowly rhomboid, strongly attentuate or subcaudate at apex.—NOVA SCOTIA: springy ditch, Sand Beach, Yarmouth County, July 14, 1920, *Fernald* & *Long*, no. 20,296 (TYPE in Gray Herb.); damp roadside, east of Rockville, Yarmouth County, July 14, 1920, *Pease* & *Linder*, no. 20,289. See p. 107.

C. SCOPARIA, var. SUBTURBINATA Fernald & Wiegand, RHODORA, xiv. 116 (1912). Collected by us at one of the original stations, Meteghan; also at Deerfield, Yarmouth Co.

** C. SCOPARIA, var. TESSELLATA Fernald & Wiegand, RHODORA, xii. 135 (1910). Wet sandy and gravelly swales and roadsides, Belleville, Yarmouth Co. (scales almost black, darker than in the original material).

* C. CRAWFORDII Fernald. Swales and damp peaty barrens, Cumberland Co. to Cape Breton, west to Annapolis and Queens Cos.

C. PROJECTA Mackenzie. *C. tribuloides*, var. *reducta* Bailey. Meadows and damp thickets, apparently throughout the province. This includes the Nova Scotia material recorded by Macoun as *C. cristata*.

* C. ALBOLUTESCENS Schwein., var. CUMULATA Bailey. Dry or moist open barrens, frequent from Yarmouth to Lunenburg and Cumberland Cos., thence into New Brunswick and Prince Edward Island. Perhaps specifically distinct. See pp. 132, 138, 150. Ordinarily, the round-based spikes are densely crowded but in one collection (no. 20,311 from Broad River, Queens) a single tuft shows both crowded and moniliform inflorescences; the latter 1 dm. long, with 7 remote spikes.

** C. **albolutescens** var. **cumulata** × **scoparia**, n. hybr., *C. scopariam* simulans, sed foliis latioribus; spicis brunneis late obovoideis apice truncatis; perigyniis ovatis vel obovatis plerumque vacuis.

Similar to *C. scoparia* but with broader leaves: spikes brown, broadly obovoid, truncate at summit: perigynia ovate or obovate, mostly empty.—NOVA SCOTIA: with the parents but more abundant than either, damp *Polytrichum*-covered sandy plains, Middleton, Annapolis Co., July 20, 1920, *Fernald, Pease & Long*, no. 20,327 (TYPE in Gray Herb.). See p. 138.

** C. STRAMINEA Willd. Rare. YARMOUTH Co.: low woods and thickets by Butler's (Gavelton) Lake, Gavelton. SHELBURNE Co.: thicket bordering salt marsh, Villagedale; moist *Polytrichum*-covered barrens near Clement Pond, Barrington.

This is *C. straminea* as interpreted by Mackenzie (Bull. Torr. Bot. Cl. xlii. 605), a coastal plain species recognized by Mackenzie as extending from Louisiana to southern New York. Subsequently, Bicknell (Bull. Torr. Bot. Cl. xliv. 377) has reported it from Nantucket, Mr. F. C. Seymour has found it on Martha's Vineyard and I have collected it in swampy thickets on Cape Cod. The plant called *C. straminea* in Gray's Manual, ed. 7, is *C. tenera* Dewey.

C. HORMATHODES Fernald. Brackish or fresh marshes not far from the sea, common throughout the province. Macoun's report of *C. straminea*, var. *festucacea* from Baddeck was based on material of *C. hormathodes*.

C. SILICEA Olney. Sands, barrier beaches and rocks of the outer coast, from Yarmouth Co. to Cape Breton. See pp. 141, 150, 158.

* C. BEBBII Olney. Seen only in CAPE BRETON Co.: boggy swale on hillside near limestone quarry, George River. See p. 165.

* C. FOENEA Willd., var. PERPLEXA Bailey. Sandy thicket, Middleton, Annapolis Co. See p. 138.

C. leporina L. Common in springy or seepy fields and roadsides, Digby, Yarmouth and Shelburne Cos. See p. 95.

*C. AENEA Fernald. Apparently rare in Nova Scotia. YARMOUTH Co.: dry *Polytrichum*-covered barrens near head of Abram River. CUMBERLAND Co.: dry open barrens, Springhill Junction. See pp. 132, 142. Collected by Macoun at Point Pleasant, Halifax, this plant erroneously referred by me in Proc. Am. Acad. xxxvii. 471 (1902) to *C. pratensis* Drej.

C. EXILIS Dewey. Bogs and peaty barrens, throughout the province. See pp. 96, 161.

C. ATLANTICA Bailey. *C. sterilis* of Gray's Man. ed. 7. Common on bogs and peaty barrens from Yarmouth to Annapolis Co. and southeastern Guysboro Co. (Canso, *Fowler*). See pp. 96, 99, 104, 138.

** C. HOWEI Mackenzie, Bull. Torr. Bot. Cl. xxxvii. 245 (1910). *C. scirpoides*, var. *capillacea* (Bailey) Fernald. Wet woods and thickets and boggy swales, abundant in Digby and Yarmouth Cos. See pp. 96, 104.

C. DEWEYANA Schwein. Rich woods, Annapolis Co. to Victoria Co. See p. 136.

C. TRISPERMA Dewey, var. BILLINGSII Knight. Characteristic of dryish knolls in bogs and peaty barrens throughout the province; typical C. TRISPERMA being characteristic of mossy woods and wet thickets. See p. 99.

C. NORVEGICA Willd. To the few recorded stations may be added: salt marshes at Sand Beach and Chebogue (Yarmouth Co.) and marshes along George River (Cape Breton Co.). See p. 103.

C. TENELLA Schkuhr. Mossy woods, Hants and Halifax Cos. to Cape Breton.

C. ROSEA Schkuhr. To the very few recorded stations should be added: alluvial woods along Five-Mile River, Hants Co. See pp. 136, 170.

* C. ROSEA, var. RADIATA Dewey. Rich woods near gypsum cliffs along Five-Mile River, Hants Co.

* C. VULPINOIDEA Michx. Roadside ditch, Middleton, Annapolis Co.

C. DIANDRA Schrank. Springy bogs and swales, Cumberland and Hants Cos. to Cape Breton. See p. 131.

C. CRINITA Lam. Frequent in the western Counties. The easternmost specimens seen are from Pictou Co.

* C. CRINITA, var. GYNANDRA (Schwein.) Schwein. & Torr. Generally distributed from Yarmouth Co. to Cape Breton.

* C. LENTICULARIS Michx. Gravelly and sandy lake-margins, Yarmouth Co. to Halifax Co., and probably eastward. See p. 102.

C. GOODENOWII J. Gay, var. STRICTIFORMIS (Bailey) Kükenthal in Engler, Pflanzenr. iv. Fam. 20: 316 (1909). This is the most extreme variation we have of *C. Goodenowii;* being usually cespitose, with tall culms and conspicuously stipitate perigynia. Widely distributed in brackish or fresh soils in Nova Scotia. See p. 157.

C. AUREA Nutt. Damp calcareous or argillaceous soil, Annapolis Co. to Cape Breton. See pp. 133, 165, 170.

C. PAUCIFLORA Lightf. One of the most characteristic species of sphagnous bogs. See pp. 96, 99.

C. POLYGAMA Schkuhr. Occasional throughout the province in peaty or gravelly soils. See pp. 101, 135.

C. VIRESCENS Muhl., var. SWANII Fernald. Local in YARMOUTH Co.: dryish peaty barrens, Yarmouth; boggy pasture, Centre Chebogue.

C. GRACILLIMA Schwein. Dry or moist woods and thickets, Cumberland Co. to Digby Co. and Cape Breton.

* C. UMBELLATA Schkuhr, var. TONSA Fernald. Dry open soil, Yarmouth Co. to Lunenburg and Annapolis Cos. See p. 130.

C. VARIA Muhl. Abundant in dry or moist peaty soil, even on knolls in sphagnous bogs, Yarmouth and Shelburne Cos.

* C. PENNSYLVANICA Lam., var. LUCORUM (Willd.) Fernald. Dry rocky and gravelly soil by railroad, west of Bridgewater, Lunenburg Co. See p. 130.

C. PANICEA L. On damp argillaceous grassy or peaty slopes, local, perhaps introduced but now thoroughly naturalized. YARMOUTH Co.: Yarmouth; Chebogue; Lower Argyle. SHELBURNE Co.: Shag Harbor. See pp. 95, 155.

C. EBURNEA Boott. Characteristic of dry crevices of gypsum outcrops. Recorded by Nichols from northern Cape Breton. Seen by us on gypsum at Five-Mile River (Hants) and Port Bevis (Victoria). See pp. 136, 164, 170.

C. LEPTONERVIA Fernald, RHODORA, xvi. 214 (1914). Rich woods and thickets, generally distributed through the province, but rare southwestward. Macoun's record of *C. laxiflora,* var. *patulifolia* was based on this species.

C. CONOIDEA Schkuhr. Sterile or peaty fields and meadows, frequent from Yarmouth to Halifax and Pictou Cos.

C. FLAVA L. Frequent or common throughout.

* C. CRYPTOLEPIS Mackenzie, Torreya, xiv. 157 (1914). Less common than *C. flava.* Seen by us only in HANTS Co.: swaley border of pond near Five-Mile River.

C. OEDERI Retz. YARMOUTH Co.: sphagnous swale bordering Beaver Lake; gravelly and rocky shore of Lake Annis. ANNAPOLIS Co.: swales and low pastures near Bay of Fundy, Margaretville, the long-spiked ** forma ELATIOR (N. J. Anders.) Kükenth. Col-

lected in typical form at Baddeck, July 11, 1898, by John Macoun (no. 20,810; distributed as *C. extensa*).

C. Oederi, var. pumila (Coss. & Germ.) Fernald. Common, and apparently freely hybridizing with *C. flava*.

C. arctata Boott. Woods and rich thickets, Cumberland Co. to Digby Co. and Cape Breton.

C. scabrata Schwein. Alluvial woods, Annapolis Co. to Colchester Co.; Victoria Co. See pp. 136, 140.

C. oligosperma Michx. Boggy swales and barrens, locally abundant. Yarmouth Co.: Argyle; Kegeshook Lake. Queens Co.: Port Mouton. See pp. 99, 148, 167, 169.

* C. riparia W. Curtis, var. lacustris (Willd.) Kükenthal. Local. Yarmouth Co.: border of brackish marsh, Sand Beach. Hants Co.: pond-hole near Five-Mile River. See p. 137.

C. Pseudo-Cyperus L. Frequent in boggy swales from Annapolis and Queens Cos. to Cape Breton.

C. retrorsa Schwein. Alluvial woods and swales, Annapolis Co. to Cape Breton. See p. 164.

C. lupulina Muhl. Seen in western Nova Scotia only in a swale at Carleton, Yarmouth Co.

* C. intumescens Rudge, var. Fernaldii Bailey. Occasional throughout the province.

C. folliculata L. Recorded by Macoun from Halifax, by Nichols from northern Cape Breton. Characteristic of swales, boggy thickets and wet woods throughout the silicious regions of Digby and Yarmouth Cos.

C. vesicaria, var. jejuna Fernald. Digby Co.: sandy beach of Lily Lake, Sandy Cove.

** C. bullata Schwein., var. Greenei (Boeckl.) Fernald. Swales, boggy meadows, and wet woods, abundant from Digby, Yarmouth and Shelburne Cos. to Queens. See pp. 97, 99, 104, 150.

Arisaema triphyllum (L.) Schott, var. Stewardsonii (Britton) Stevens. The only material of *A. triphyllum* seen by us in Nova Scotia belonged to var. *Stewardsonii*. See p. 136.

Calla palustris L. Rare in western Nova Scotia. Seen only at the quaking margin of Trefry's Lake, Arcadia, Yarmouth Co. See p. 145.

Symplocarpus foetidus (L.) Nutt. Springy swales, open bogs and boggy woods and thickets, frequent in Yarmouth and southern Digby Cos.

Lemna trisulca L. Cumberland Co.: spring-pools and ditches south of Amherst. Collected by me in 1902 at Sheffield's Mills, Kings Co. and reported by Macoun from Windsor. See p. 131.

L. minor L. Cumberland Co.: pools south of Amherst. Victoria Co.: Port Bevis and Iona. Recorded by Macoun from stations from Pictou Co. to Hants Co. and collected by me in 1902 at Sheffield's Mills, Kings Co. See p. 131.

XYRIS MONTANA Ries. DIGBY CO.: wet peaty hollows in savannahs along Little River, east of Tiddville. YARMOUTH CO.: peaty sloughs and boggy barrens, many parts of Argyle. SHELBURNE CO.: damp sand-flats, Villagedale. Earlier records of *X. flexuosa* probably belong here. See pp. 99, 148, 149, 150, 161.

X. CAROLINIANA Walt. Wet sandy, gravelly or peaty borders of lakes, sloughs in boggy barrens, etc., common in Digby and Yarmouth Cos. and locally eastward at least to Halifax Co. Records of *X. bulbosa* probably belong here. See pp. 99, 104, 134, 157, 161.

JUNCUS BUFONIUS L., var. HALOPHILUS Buchenau & Fernald. YARMOUTH CO.: sandy border of salt marsh, Pubnico. QUEENS CO.: damp sand-flats, Central Port Mouton and at mouth of Broad River. See p. 158.

* J. TENUIS Willd., var. WILLIAMSII Fernald. Open grassy roadside, Tusket Falls, Yarmouth Co.

* J. DUDLEYI Wiegand. Swale at southern base of North Mountain, Middleton, Annapolis Co. See pp. 140, 170.

* J. GREENEI Oakes & Tuckerm. Sand dunes, Villagedale, Shelburne Co. See p. 150.

J. EFFUSUS L., var. COMPACTUS Lejeune & Courtois. Common throughout the province.

** J. EFFUSUS, var. **costulatus** n. var., caulibus gracilibus 0.4–1.2 m. altis basi 1.5–4 mm. diametro valde costulatis; cataphyllis basilariis chartaceis purpurascentibus vel fulvescentibus supremis griseostramineis basi purpur ascentibus0.5–2 dm. longis; inflorescentia laxa vel subcongesta 1–7.5 cm. diametro; sepalis petalisque subaequalibus 2.2–3 mm. longis subrigidis lanceolato-attenuatis stramineis; capsulis fulvis vel olivaceis retusis perianthium aequantibus vel eo paulo brevioribus.

Culms slender, 0.4–1.2 m. high, 1.5–4 mm. in diameter at base, strongly costulate: basal sheaths papery, purplish or reddish-brown; the upper grayish-stramineous, purplish at base, 0.5–2 dm. long: inflorescence lax or somewhat crowded, 1–7.5 cm. in diameter: sepals and petals subequal, 2.2–3 mm. long, rather rigid, lance-attenuate, stramineous: capsule reddish or olivaceous, retuse, equaling or but slightly shorter than the perianth.—Quebec, Prince Edward Island and Nova Scotia to South Carolina. The following, of many numbers examined, are characteristic. QUEBEC: vicinity of Cap à L'Aigle, August 18, 1905, *J. Macoun*, no. 68,858. PRINCE EDWARD ISLAND: fresh or slightly brackish reclaimed marshes along Hillsborough River, Mt. Stewart, July 30, 1912, *Fernald, Bartram, Long* & *St. John*, no. 7164; damp border of heath-barren, Lot 40, August 8, 1914, *Fernald* & *St. John*, no. 10,985. NOVA SCOTIA: low ground, Sydney, August 17, 1902, *Fernald;* wet sphagnous spruce bog near Louis Lake, Port Joli, August 17, 1920, *Fernald, Long* & *Linder*, no. 20,661; boggy barrens near Clement Pond, Barrington, August 9, 1920, *Fernald, Long* & *Linder*, no. 20,654 (TYPE in Gray Herb.);

spruce and red maple swamps by Trefry's Lake, Arcadia, July 29, 1920, *Fernald* & *Long*, no. 20,653. Maine: border of salt marsh, Wells, August 8, 1916, *Fernald* & *Long*, no. 13,192. New Hampshire: by brook, East Andover, August 13, 1903, *M. A. Day*. Massachusetts: swale near Zion's Hill, Winchester, July 15, 1913, *Fernald*, no. 9173; sandy shore of Clear Pond, Lakeville, August 26, 1913, *Fernald* & *Long*, no. 9180; thin sphagnous peat overlying sand, Wareham, October 2, 1913, *Fernald* & *Long*, no. 9187; small quagmire in woods south of Sparrow Young's Pond, Chatham, July 15, 1918, *Fernald*, no. 16,538; boggy swale, Orleans, July 22, 1919, *Fernald* & *Long*, no. 18,202; border of cattail marsh, South Truro, August 10, 1919, *Fernald* & *Long*, no. 18,203; along Look's Brook, West Tisbury, Martha's Vineyard, July 26, 1916, *F. C. Seymour*, no. 1146; gutters in slightly sandy soil, Worthington, August 12, 1912, *B. L. Robinson*, no. 516. Rhode Island: wet open sphagnous thickets, southwest of Harbor Pond, Block Island, August 19, 1913, *Fernald* & *Long*, nos. 9176, 9177. New Jersey: Bear Swamp, Lawrenceville Sta., Mercer Co., June 20, 1913, *Bartram*. Pennsylvania: Bush Hill Falls, Monroe Co., July 10–14, 1903, *Stone*, no. 5392. South Carolina: Florence, May 18, 1912, *Bartram*.

The coastal plain representative of the usually more northern var. *Pylaei* (Laharpe) Fernald & Wiegand, the latter plant having usually strongly costulate culms, but larger flowers (3–4.3 mm. long), with the sepals definitely exceeding the petals. In the Cape Cod region var. *costulatus* is the most abundant variety of *J. effusus* and in a letter concerning its occurrence in New Jersey Mr. E. B. Bartram wrote, under date of November 9, 1913: "When I first collected the New Jersey plant in June I was strongly impressed with the appearance it made in the field as compared with var. *solutus*. The two plants were common in the same marsh but they formed large colonies that could readily be distinguished from each other at a considerable distance. The darker colored and more compact inflorescences of the unnamed variety contrasted strongly with the lighter colored and more open inflorescences of var. *solutus*. In travelling to and from New York across the northern portion of the New Jersey coastal plain I was able to distinguish the two forms quite clearly from the train. From these observations I should say that the var. *solutus* is decidedly in the minority throughout the region between Trenton and New Brunswick. . . . We turned up the same thing in lower Delaware along the Indian River." See p. 145.

J. effusus, var. solutus Fernald & Wiegand, Rhodora, xii. 90 (1910). Common throughout the province.

* J. EFFUSUS, var. PYLAEI (Laharpe) Fernald & Wiegand, RHODORA, xii. 92 (1910). Open swampy thickets, Baddeck.

J. CANADENSIS J. Gay. Abundant in wet sandy or peaty soils, Yarmouth Co. to Annapolis and Queens Cos.

** J. CANADENSIS J. Gay, var. **sparsiflorus**, n. var., dense cespitosus robustus 6–8 dm. altus; inflorescentiis 0.7–2 dm. longis, ramis erectis vel valde adscendentibus rigidis; capitulis discretis plerumque 3–7-floris; perianthiis 3.5–4 mm. longis.

Densely cespitose, robust, 6–8 dm. high: inflorescences 0.7–2 dm. long, with erect or strongly ascending rigid branches: heads scattered, mostly 2–7-flowered: perianths 3.5–4 mm. long.—NOVA SCOTIA: boggy savannah bordering Butler's (Gavelton) Lake, September 2, 1920, *Fernald & Long*, no. 20,685, September 4, *Fernald, Long & Linder*, no. 20,686 (TYPE in Gray Herb.); boggy savannah bordering St. John Lake, Springhaven, October 8, 1920, *Fernald & Linder*, no. 20,687. MASSACHUSETTS: sandy and peaty margin of pond between Grassy and Lower Simmons Ponds, Dennis, August 22, 1918, *Fernald & Long*, no. 16,549. See p. 166.

In typical *J. canadensis* the branches are less erect, the flowers very numerous in the glomerules and the perianths 2.5—rarely 3.5 mm. long.

** J. SUBCAUDATUS (Engelm.) Coville & Blake, var. **planisepalus**, n. var., a forma typica differt perianthiis 2–3 mm. longis; sepalis petalisque lanceolatis planis dorso viridibus; capsulis maturis valde exsertis.

Differing from the typical southern form in having the perianth 2–3 mm. long: sepals and petals lanceolate, flat and green on the back: mature capsule conspicuously exserted.—Savannahs, bogs and spruce swamps of Nova Scotia. DIGBY CO.: thickets bordering savannahs by Little River, east of Tiddville, August 22, 1920, *Fernald & Long*, no. 20,671 (TYPE in Gray Herb.). YARMOUTH CO.: sphagnous bog at edge of spruce swamp, Belleville, July 27, *Long & Linder*, no. 20,665; springy sphagnous spot at border of spruce woods near Randel Lake, Argyle, August 4, *Long & Linder*, no. 20,666; sphagnous swales bordering Salmon (Greenville) Lake, August 13, *Fernald, Bissell, Graves, Long & Linder*, no. 20,668; open grassy roadside, Tusket Falls, August 20, *Fernald, Bissell, Graves, Long & Linder*, no. 20,670; spruce and alder swamp, Pembroke Shore, October 6, *Fernald & Linder*, no. 20,723; boggy margin, East Branch of Tusket River, Quinan, October 8, *Fernald & Linder*, no. 20,672. SHELBURNE CO.: spruce swamp, Villagedale, August 7, *Fernald, Long & Linder*, no. 20,667. QUEENS CO.: springy sphagnous bog in spruce woods near mouth of Broad River, August 16, *Fernald & Bissell*, no. 20,669.

In the southern form of the species the perianths are 3–4 mm. long; the sepals and petals lance-linear and conspicuously ribbed or corrugated and the capsule commonly but little exserted. Some speci-

mens from southeastern Connecticut seem to be transitional. See pp. 142, 149, 156, 158.

J. PELOCARPUS Meyer. Although not recognized in Macoun's *Catalogue, J. pelocarpus* is characteristic of wet sandy shores throughout Nova Scotia.

J. MILITARIS Bigel. Typical of sandy and peaty lake-margins throughout the silicious regions of the province.

* J. ACUMINATUS Michx. Local in YARMOUTH Co.: clayey roadside ditch, Yarmouth; springy ditches near Trefry's Lake, Arcadia; sandy and muddy tidal flats of Tusket River, Tusket Falls; springy ditches and wet roadsides, Abram River. Included in Lindsay's Catalogue, but apparently through error of determination. See pp. 105, 142.

J. ARTICULATUS L., var. OBTUSATUS Engelm. Common especially in brackish soil where it largely replaces the typical form of the species. See p. 142.

J. ARTICULATUS × BREVICAUDATUS. Abundant in peaty swales at Yarmouth. Less abundant on savannah near Tiddville, Digby Co. See p. 152.

J. ARTICULATUS × CANADENSIS. Dryish sphagnous swale, Tiddville, Digby Co.; sphagnous swale, Lower Argyle, Yarmouth Co.

J. ARTICULATUS × NODOSUS. Sterile plants with *J. articulatus* L. and *J. nodosus* L. in a brackish swale at Baddeck (*Fernald & Long*, nos. 20,721 and 20,722) seem to be of this origin.

J. MARGINATUS Rostk. Local in YARMOUTH Co.: springy ditches and wet roadsides, Abram River; wet clayey brookside, Argyle Head. Reported by Lindsay as collected by Sommers at Halifax. See pp. 142, 149.

* *Ornithogalum umbellatum* L. Thoroughly naturalized with *Leucojum aestivum* and considered a troublesome weed in an old field, Yarmouth.

SMILACINA RACEMOSA (L.) Desf. Not seen southwest of Annapolis Co.

STREPTOPUS AMPLEXIFOLIUS (L.) DC. Not seen in the southwestern counties.

POLYGONATUM BIFLORUM (Walt.) Ell. Not seen in Yarmouth and Shelburne Cos

Convallaria majalis L. Somewhat established in woods near Yarmouth. See p. 95.

TRILLIUM ERECTUM L. Not seen west of Annapolis Co. See p 140.

T. CERNUUM L. Not seen in the southwestern counties where *T. undulatum* Willd. is common.

SMILAX ROTUNDIFOLIA L. Thickets bordering lakes and rivers, frequent in Digby and Yarmouth Cos.; also seen along Sable River, Shelburne Co. See pp. 109, 145, 147.

** S. ROTUNDIFOLIA, var. QUADRANGULARIS (Muhl.) Wood. Frequent with the typical form or in separate colonies, Yarmouth Co. See pp. 144, 147.

LOPHIOLA **septentrionalis**, n. sp. Planta stolonifera caulibus solitariis vel laxe cespitosis 4–5.5 dm. altis; foliis linearibus imis usque 3 dm. longis 1.5–3.5 mm. latis plerumque 8-nerviis margine hyalinis basi deinde fulvis; inflorescentiis laxis paniculato-corymbiformibus 0.6–1.8 dm. altis 0.6–1.2 dm. latis, rhachi ramibusque imis valde adscendentibus sparse villosis vel glabratis, pedicellis adscendentibus albido-tomentosis plerumque 0.7–1.5 cm. longis; bracteis oblongo-lanceolatis scariosis fulvis; perianthiis 1.2–1.5 cm. diametro, segmentis patentibus vel reflexis lanceolatis subtus villoso-tomentosis supra fulvis apice glabris basi medioque longe villoso-barbatis pilis aureis deinde flavescentibus; filamentis 3 mm. longis, antheris oblongis 1.2 mm. longis; capsulis rufescentibus vel fulvis conico-ovoideis rostratis fere basi liberis 4–4.5 mm. longis 3 mm. latis; seminibus fusiformi-obovatis vel clavatis vel semi-obovatis stramineis longitudinaliter obscure corrugatis 1–1.4 mm. longis apice rotundatis brunneo-tinctis basi plerumque caudatis.

Plant stoloniferous; the stems solitary or loosely cespitose (often with 2 or 3 flowering stems and many crowded leafy tufts), 4–5.5 dm. high: leaves linear; the lower up to 3 dm. long, 1.5–3.5 mm. wide, mostly 8-nerved, hyaline at margin, finally fulvous at base: inflorescences lax, paniculate-corymbiform, 0.5–1.8 dm. high, 0.6–1.2 dm. broad, the rhachis and strongly ascending lower branches sparingly villous or glabrate; the ascending pedicels white-tomentose, mostly 0.7–1.5 cm. long: bracts oblong-lanceolate, scarious, fulvous: perianths 1.2–1.5 cm. in diameter; the segments spreading or reflexed, lanceolate, villous-tomentous beneath, fulvous above and glabrous at tip but with the basal half or two-thirds villous-bearded with golden or finally only yellowish long crinkled hairs: filaments 3 mm. long; anthers oblong, 1.2 mm. long: capsules reddish or fulvous, conic-ovoid, beaked, free almost to the base, 4–4.5 mm. long (including the beak), 3 mm. broad: seeds fusiform-obovate, clavate or semi-ovate, straw-colored, longitudinally but obscurely corrugated, 1–1.4 mm. long, rounded and brown-tinged at apex, usually tailed at base. —NOVA SCOTIA: wet savannahs along Little River east of Tiddville, Digby Co., August 22, 1920, *Fernald* & *Long*, no. 20,784 (TYPE in Gray Herb.), October 13, 1920, *R. W. Sypher*, no. 20,785.

Differing from both *L. aurea* Ker, which extends from Mississippi to Florida and locally to South Carolina, and *L. americana* (Pursh) Wood, of the New Jersey pine-barrens, in its fulvous capsule free nearly to base and in its caudate-based seeds, both the more southern species having the green capsules adnate at least half their length to the perianth and the seeds rounded at both ends. *L. aurea* has

much coarser leaves, commonly 5–8 mm. wide with 10–14 nerves; very many more flowers on shorter pedicels, and smaller perianth with narrowly oblong segments with the shorter beard only at base. *L. americana* is usually lower and the splendid representation generously loaned me by the New York Botanical Garden, Academy of Natural Sciences of Philadelphia, United States National Museum and Missouri Botanical Garden shows no tendency to the cespitose or subcespitose habit of *L. septentrionalis*. *L. americana*, furthermore, has the much denser inflorescences heavily tomentose and with short pedicels. See further discussion on pp. 160-163, 168.

** *Leucojum aestivum* L. The Summer Snowflake of gardens is thoroughly naturalized with *Ornithogalum umbellatum* and considered a troublesome weed in an old field at Yarmouth.

"Thoroughly and abundantly established . . . in a brook whence it is rapidly spreading, Brunswick," Maine,—now established for about 40 years.—See Fernald, Proc. Portl. Soc. Nat. Hist. ii. 133 (1897).

Iris setosa Pall., var. canadensis Foster. Apparently not common west of Cape Breton. Guysborough Co.: Canso, *Fowler*. Queens Co.: upper border of the beach, Central Port Mouton. Annapolis Co.: crests of basalt cliffs by Bay of Fundy, Margaretville. See p. 139.

Iris pseudacorus L. Well naturalized about pools and ditches, Yarmouth. See p. 95.

Sisyrinchium gramineum Curtis. Common in damp grassy, peaty or gravelly open places, Yarmouth Co. to Halifax Co. See pp. 95, 134, 147.

** S. atlanticum Bicknell. Common in damp peaty, sandy or gravelly soil, Yarmouth Co. to Queens Co. See pp. 95, 99.

** S. arenicola Bicknell. Yarmouth Co.: dry sandy bank, Yarmouth. Annapolis Co.: damp *Polytrichum*-covered sandy plains, Middleton. See pp. 96, 138.

Habenaria viridis (L.) R. Br., var. bracteata (Muhl.) Gray. *H. bracteata* (Muhl.) R. Br. Rich woods, Folleigh, Colchester Co. See p. 136.

** H. flava (L.) Spreng. Yarmouth Co.: peaty and cobbly beach of Salmon (Greenville) Lake; wet peaty margin of Butler's (Gavelton) L., Gavelton; gravelly margin of Tusket (Vaughan) L.; sandy and cobbly beach of Fanning Lake, Carleton. Not known nearer than Trenton, New Jersey (see pp. 147, 148, 160, 168). The plants of eastern Nova Scotia (Boylston, *C. A. Hamilton*) is var. virescens (Muhl.) Fernald, p. 148.

H. hyperborea (L.) R. Br. Not seen west of Annapolis and Queens Cos.

H. OBTUSATA (Pursh) Richards. Not seen west of Colchester and Queens Cos.

H. HOOKERI Torr. Not seen west of Queens Co.

H. MACROPHYLLA Goldie. COLCHESTER Co.: rich woods, Folleigh. CAPE BRETON Co.: mixed woods, North Sydney. See p. 136.

H. BLEPHARIGLOTTIS (Willd.) Torr. Abundant on boggy barrens and even in dryish barrens and spruce thickets, Yarmouth Co.; seen only in peat overlying the gold-bearing series in southern Shelburne and Queens Cos. and not observed on the granitic areas. See pp. 90, 110, 142, 148, 157.

** POGONIA OPHIOGLOSSOIDES (L.) Ker, var. **brachypogon**, n. var., barba labii obsolescente; segmentis perianthii vix divergentibus; planta plerumque subcespitosa.

Beard of the lip obsolescent, represented by short knobs: segments of the perianth scarcely divergent: plant usually subcespitose.—NOVA SCOTIA: forming dense colonies, sandy and gravelly beach of Cedar Lake, Yarmouth Co., July 11, 1920, *Fernald, Bissell, Pease, Long* & *Linder*, no. 20,888 (TYPE in Gray Herb.); Cedar Lake, Digby Co., July 25, *Fernald, Bean* & *White*, no. 20,889; dryish upper cobbly beach of Jassy Lake, Lake Annis, July 29, *Bean, White* & *Linder*, no. 20,891; wet sandy and peaty pockets in cobble-beach of Trefry's Lake, Arcadia, July 29, *Fernald* & *Long*, no. 20,892.

Other material from Trefry's Lake (no. 20,881) and from Clearwater Lake, Belleville (no. 20,890) is transitional to the typical form of the plant with long beard on the lip. Some specimens from Newfoundland and the Magdalen Islands are also transitional. For further discussion see pp. 102, 140.

** CALOPOGON PULCHELLUS (Sw.) R. Br., forma **albiflorus** (Britton), n. comb. *C. tuberosus*, forma *albiflorus* Britton, Bull. Torr. Bot. Cl. xvii. 125 (1890). YARMOUTH Co.: a single plant, sandy and peaty margin of Lake Annis.

For note on generic and specific names see p. 132.

SPIRANTHES CERNUA (L.) Richard. Boggy meadows and clearings and sandy shores, Yarmouth Co. to Halifax Co.

** S. CERNUA, var. OCHROLEUCA (Rydb.) Ames. YARMOUTH Co.: sandy fields and dry rocky barrens, Pubnico. See p. 167.

LIPARIS LOESELII (L.) Richard. Occasional in peaty meadows and peaty and cobbly lake-shores, Yarmouth and Digby Cos. See p. 141.

SALIX CORDATA Muhl. Not seen in Yarmouth, Shelburne, and Queens Cos., nor in southwestern Digby Co.

S. PYRIFOLIA Anderss. *S. balsamifera* Barratt. Swampy thickets throughout the province.

(To be continued.)

THE GRAY HERBARIUM EXPEDITION TO NOVA SCOTIA, 1920.

M. L. Fernald.

(*Continued from p. 245.*)

S. SERICEA Marsh. Apparently rare in western Nova Scotia. YARMOUTH CO.: sandy and cobbly beach of Fanning Lake, Carleton.

* S. ROSTRATA Richardson, var. CAPREIFOLIA Fernald, RHODORA, xvi. 177 (1914). DIGBY CO.: small trees in woods and thickets at margin of Lily Lake, Sandy Cove.

** S. HUMILIS Marsh., var. KEWEENAWENSIS Farwell, Mich. Acad. Sci. Ann. Rep. vi. 206 (1904). Most if not all material from the Maritime Provinces and Newfoundland belongs to this northern variety, characterized by broadish often obovate leaves with a satiny or lustrous velvety pubescence. It is widely dispersed in Nova Scotia in both dry and wet habitats.

** *S. Smithiana* Willd. See Fernald & Wiegand, RHODORA, xii. 104, 137 (1910). Naturalized on clay bank by the sea, Baddeck.

* *S. purpurea* L. Very abundantly naturalized by wet roadsides about Yarmouth. See p. 95.

MYRICA CAROLINENSIS Mill. Abundant in the silicious regions, but rare or perhaps largely absent from Digby to Truro.

* BETULA LUTEA Michx. f., var. ALLEGHANIENSIS (Britton) Ashe, Bull. Charleston Mus. xiv. 11 (1918). Wooded lake-margins of Yarmouth and Digby Cos. apparently as common as typical *B. lutea*. Macoun's records of *B. lenta* may be based on var. *alleghaniensis*.

* B. PAPYRIFERA Marsh., var. CORDIFOLIA (Regel) Fernald. Occasional in Yarmouth Co.

OSTRYA VIRGINIANA (Mill.) K. Koch. Not seen west of Annapolis Co. See pp. 137, 170.

** ALNUS INCANA (L.) Moench, var. HYPOCHLORA Call. Jahresb. Schles. Ges. lxix. pt. 2: 79 (1891). Leaves green beneath, slightly pubescent or glabrate. YARMOUTH CO.: thicket bordering Sloane Lake, Pleasant Valley.

Urtica dioica L. Waste ground about towns; occasional in Yarmouth and Shelburne Cos.

LAPORTEA CANADENSIS L. HANTS CO.: alluvial woods along Five-Mile River. See pp. 137, 170.

ARCEUTHOBIUM PUSILLUM Peck. Apparently common throughout the province. See p. 97.

** *Rumex alpinus* L. YARMOUTH CO.: abundantly naturalized in a springy field, Rockville. See p. 107.

R. PALLIDUS Bigel. Gravelly sea-beaches, Yarmouth and Shelburne Cos. See p. 155.

** *R. obtusifolius* L., var. *sylvestris* (Lam.) Koch. Lower leaves oblong-lanceolate, acute. Digby Co.: roadside ditches, Sandy Cove. Naturalized also about Charlottetown, Prince Edward Island, and Bay of Islands, Newfoundland.

R. maritimus L., var. fueginus (Phil.) Dusén. See St. John, Rhodora, xvii. 81 (1915). Queens Co.: brackish sands, scarce, Central Port Mouton and at mouth of Broad River. See p. 158.

R. Acetosa L. Thoroughly naturalized in damp fields and swales, Yarmouth and Digby Cos. and occasional elsewhere. See pp. 95, 107.

Polygonum lapathifolium L. Sp. Pl. i. 360 (1753) as to name-bringing synonym. *P. pennsylvanicum*, var. Curt. Fl. Lond. i. t. 25 (1777). *P. lapathifolium*, var. *pecticale* Stokes in With., Bot. Arr. ed. 2, i. 412 (1787). *P. lapath.*, var. *maculatum* Sibth. Fl. Oxon. 129 (1794). *P. nodosum* Pers. Syn. i. 440 (1805). *Persicaria maculata* (Sibth.) S. F. Gray, Nat. Arr. Brit. Pl. ii. 270 (1821). *Peutalis nodosa* (Pers.) Raf. Fl. Tell. iii. 14 (1836). *Pol. lapath.*, var. *nodosum* (Pers.) Wein. Enum. Petrop. 42 (1837). *Persicaria nodosa* (Pers.) Opiz, Sezn. 72 (1852). *Pol. lapath.*, subsp. *maculatum* (Sibth.) Dyer & Trimen, Journ. Bot. ix. 36 (1871). *Pol. maculatum* (Sibth.) Babington, Man. ed. 7, 301 (1874).—Local weed in cultivated land, Yarmouth.

I see no reason to restrict the name *P. lapathifolium* L. to *P. scabrum* Moench, as is done by some European authors. Admitting that the Linnean species was a mixture of that and the purplish-flowered plant separated as *P. nodosum* Pers., we have two essential facts which lead to the retention of *P. lapathifolium* for *P. nodosum*. Linnaeus's account was as follows:

"*Lapathifolium* 6. POLYGONUM floribus pentandris semidigynis, staminibus corollae regulari aequalibus.
Persicaria floribus pentandris digynis, corolla regulari staminibus aequali. *Wach. ultr.* 257.
Persicaria florum staminibus quinis semidigynis, stylo bifido corollae regulari aequantibus. *Hort. cliff.* 42.
Persicaria major, lapathi foliis, calyce floris purpureo. *Tournef. inst.* 510. *Raj. suppl.* 119.
Persicaria Hydropiper. *Lob. ic.* 315.
Habitat in Gallia."

From this it should be quite clear that Linnaeus derived his specific name from *Persicaria major, lapathi foliis, calyce floris purpureo* of Tournefort and of Ray. On reference to Tournefort we find nothing but the brief description above quoted, but Ray in his full account says "*Calix* purpurascens lineam unam longus est," which better describes the shorter perianth of *P. nodosum* than the longer, usually

greenish perianth of *P. scabrum;* for in *P. nodosum,* the achene of which about equals the perianth, the achene is correctly described by Rouy as "petits (2 mm. sur 1½)" while the green-flowered *P. scabrum* has "achaînes très grands (3 mill. de long sur 2½)". In other words, *Persicaria major, lapathi foliis, calyce floris purpureo* of Tournefort and of Ray, the plant from which Linnaeus directly took the specific name, has not only the purple flowers but the small calyx of *P. nodosum* Pers.

Again in the splitting up of the complex *P. lapathifolium* of Linnaeus the first element described under a new name was *P. Persicaria* * *tomentosum* Schrank (1789) or *P. scabrum* Moench (1794) or *P. pallidum* With. (1796). These all antedated by many years *P. nodosum* Pers. (1805) and by the very sound "doctrine of residues" the removal from the complex first of *P. scabrum* left as *P. lapathifolium* the plant with small purplish flowers, the *Persicaria major, lapathi foliis* of Tournefort and of Ray. Thus by both these principles we arrive at the same conclusion, that the name *P. lapathifolium* belongs to *P. nodosum* Pers. not to *P. scabrum* Moench.

P. LAPATHIFOLIUM, var. SALICIFOLIUM Sibth. Fl. Oxon. 129 (1794). *P. incanum* Willd. Enum. Pl. Berol. 429 (1809), not F. W. Schmidt, Fl. Boem. iv. 90 (1794). *Persicaria salicifolia* (Sibth.) S. F. Gray, Nat. Arr. Brit. Pl. ii. 270 (1821). *Pol. lapathifolium,* var. *incanum* (Willd.) Koch, Syn. 617 (1837). *Pol. nodosum,* β. *incanum* (Willd.) Ledeb. Fl. Ross. iii. 521 (1849–51). *Pol. tomentosum,* var. *incanum* Robinson & Fernald in Gray, Man. ed. 7: 360 (1908), mostly, not *P. tomentosum,* var. *incanum* (Schmidt) Gurke, Pl. Eur. ii. 121 (1897) which is apparently only a minor form of *P. scabrum* Moench = *P. tomentosum* (Schrank) Gurke. *Pol. nodosum,* forma *salicifolium* (Sibth.) Moss, Cambr. Brit. Fl. ii. 117 (1914).—Damp sands and pond-margins, frequent in Yarmouth and Shelburne Cos.

P. SCABRUM Moench, Meth. 629 (1794). *P. lapathifolium* L. Sp. Pl. i. 360 (1753), in part. *P. pennsylvanicum* Huds. Fl. Angl. 148 (1762); Curtis Fl. Lond. i. t. 24 (1777); not L. *P. Persicaria* **tomentosum* Schrank, Baier. Fl. i. 669 (1789). *P. incanum* F. W. Schmidt, Fl. Boem. iv. 90 (1794). *P. pallidum* With. Bot. Arr. ed. 3, ii. 381 (1796). *P. tomentosum* (Schrank) Gurke, Pl. Eur. ii. 121 (1897); Robinson & Fernald in Gray, Man. ed. 7: 360 (1908); not Willd. *P. tomentosum,* var. *incanum* (Schmidt) Gurke, Pl. Eur. ii. 121 (1897). *Persicaria tomentosa* (Schrank) Bicknell, Bull. Torr. Bot. Cl. xxxvi. 453 (1909).—Damp sandy and gravelly shores where seemingly indigenous, and cultivated land as a weed.

* P. MUHLENBERGII (Meisn.) Watson. YARMOUTH Co.: dominant on a wet savannah bordering Butler's (Gavelton) Lake, Gaveltion. See p. 166.

* P. ACRE HBK. Including var. *leptostachyum* Meisn. Common, apparently throughout the province.

** P. ROBUSTIUS (Small) Fernald, p. 147. YARMOUTH Co.: cold brook in sphagnous swale by Salmon (Greenville) Lake; boggy swale by Tusket (Vaughan) Lake, Gavelton; peaty and muddy dried-out pond-hole near head of St. John Lake, Springhaven; in running water, thicket at margin of Randel Lake, Argyle. See pp. 146, 147, 149, 155, 166, 168.

* P. HYDROPIPEROIDES Michx. Swales, savannahs and peaty shores, valleys of the Salmon and Tusket Rivers, Yarmouth Co.

** P. HYDROPIPEROIDES Michx., var. **digitatum**, n. var., planta 1–1.5 m. alta; foliis lineari-lanceolatis attenuatis plerumque 1.3–2 dm. longis; spicis densis 0.5–1 cm. crassis ad apices ramulorum plerumque aggregatis.

Plant 1–1.5 m. high; leaves linear-lanceolate, attenuate, mostly 1.3–2 dm. long: spikes densely flowered, 0.5–1 cm. thick, mostly crowded at the tips of the branches.—NOVA SCOTIA: boggy savannah bordering St. John Lake, Springhaven, Yarmouth Co., October 8, 1920, *Fernald* & *Linder*, no. 21,093 (TYPE in Gray Herb.).

Differing from typical *P. hydropiperoides* in its great height, very elongate leaves, thick crowded spikes and very late flowering. For further notes see p. 168.

P. RAII Babington. See Fernald, RHODORA, XV. 72 (1913). Damp sands and gravels of the coast from Shelburne Co. to Cape Breton. See pp. 150, 158, 165.

P. ACADIENSE Fernald, RHODORA, XVI. 188 (1914). To the original station at Grand Narrows should be added: gravelly beach of Great Bras d'Or, Kidstone Island, very scarce. See pp. 134, 165.

* P. FOWLERI Robinson, RHODORA, IV. 67 (1902). *P. buxifolium* Nutt. in Bong. Veg. Ins. Sitcha, 161 (1832), *nomen seminudum*, as to Sitka plant only, not as to synonymy nor apparently as to reference to Nuttall's specimen; not Bieb. *P. aviculare*, ε. *buxifolium* Ledeb. Fl. Ross. iii. 532 (1849–51) as to Sitka plant only. *P. littorale*, β. *buxifolium* Meisner in DC. Prodr. xiv. 98 (1856) as to description and plant. *P. maritimum* Fowler, Prelim. List Pl. N. B. 53 (1885), not L. (1753). *P. littorale sitchense* Small, Mem. Dept. Bot. Columbia Col. i. 102 (1895).—QUEENS Co.: with *P. allocarpum* on damp sand-flats, Central Port Mouton. VICTORIA Co.: gravelly beaches of Great Bras d'Or, Baddeck and Kidstone Island. Previously collected by J. R. Churchill on the beach at Aspy Bay.

The name *P. Fowleri* is here retained as the first adequately defined *specific* name, the name *P. buxifolium* Nutt. being open to very serious doubt. In the first place Nuttall did not publish his *P. buxifolium*, a species which Bongard ascribed to him as if it had been published. Bongard's publication was as follows:

"133. *Polygonum buxifolium Nutt.*! P. aviculare β latifolium Michx. Fl. Bor. am. I. p. 237.
Polygono aviculari simillimum; sed floribus semper *pentandris* distinctum. Specimina Nuttalliana exacte cum Sitchensibus conveniunt."

From this it is evident that Bongard had a plant from Sitka which he thought to be like Nuttall material which had been called *P. buxifolium* and which was identified with *P. aviculare* β. *latifolium* Michx., and it is noteworthy that Bongard's descriptive note was borrowed directly from Nuttall and the name *buxifolium* from Michaux's description of *P. aviculare* β. *latifolium*. Thus, in the original publication of β. *latifolium* from "Kentucky et regione Illinoensi," a plant which seems to have been *P. erectum* L., Michaux said "foliis lato-ovalibus, obtusis: quasi *buxifolium* [italics mine]." —Michx. Fl. Bor.-Am. i. 237 (1803). Later, in 1818, in his *Genera* i. 254, Nuttall described *P. aviculare* as having "flowers octandrous" and maintained β. *latifolium* [= ? *P. erectum*] with "leaves broad oval, obtuse, flowers pentandrous, stem adscendent." As a matter of fact, however, the stamens of *P. aviculare* vary from 5–8, so that Bongard's descriptive phrase, "Polygono aviculari simillimum; sed floribus semper *pentandris* distinctum," borrowed directly from Nuttall's description of a plant of Kentucky and Illinois and applied to a maritime plant of Sitka, does not differentiate the Sitkan plant and the name *P. buxifolium* at best is a *nomen seminudum* based upon a complete misconception. The Sitka material, called by Bongard *P. buxifolium*, has little in common with *P. erectum* or any other species of "Kentucky et regione Illinoensi" but, as shown by a sheet preserved in the Prodromus herbarium at Geneva, is exactly *P. Fowleri*, a maritime plant of the Gulf of St. Lawrence, Nova Scotia and eastern Newfoundland and of the shores of the North Pacific from Siberia and Alaska to Washington. The first *real description* of this Sitka plant was that of Meisner in DeCandolle's Prodromus, where a definite characterization was given—a diagnosis which applies equally well to the eastern material of *P. Fowleri*. Meisner's description, published in 1856, was as follows:

P. LITTORALE, "β. *buxifolium* (Ledeb.! fl. ross. 3, p. 532, sub *P. aviculari*), caulibus abbreviatis, foliis lineari-oblongis obtusis attenuato-subpetiolatis subeveniis, axillis 1–2-floris, achaenio calycem paulo superante subnitido minute punctato obsolete striato. In ins. Sitka (Eschscholtz!)."

This diagnosis of Meisner's, as stated, was based upon the Sitka material and accurately describes it, the earlier published phrases under the names *P. buxifolium* and *P. aviculare*, var. *buxifolium* having been borrowed without change from Michaux's and Nuttall's descriptions of *P. aviculare*, β. *latifolium* from Kentucky and Illinois, a plant which is certainly not conspecific with Eschscholtz's Sitkan plant. It is, therefore, quite clear that the latter plant was not truly characterized until Meisner's publication of it as a variety and that the first specific name clearly belonging to the plant is *P. Fowleri*.

* P. ALLOCARPUM Blake, RHODORA, xix. 234 (1917). Characteristic of sea-beaches and tidal sand-flats from Digby Co. to Queens Co. See pp. 151, 163.

* *P. cuspidatum* Sieb. & Zucc. Roadsides and waste ground, Yarmouth and Halifax.

** *P. polystachyum* Wall. A tall perennial of the gardens, with very long caudate-tipped and truncate-based leaves. Beginning to spread to waste lands about Yarmouth.

** ATRIPLEX GLABRIUSCULA Edmonston, Fl. Shetl. 39 (1845). *A. Babingtonii* Woods, Tourist's Fl. 316 (1850). For detailed synonymy see Moss, Camb. Brit. Fl. ii. 177 (1914).

A. glabriuscula, a species of northwestern Europe—Scandinavia, Denmark, north Germany and France to the Faeröes and Iceland—recognized (usually as *A. Babingtonii*) by such conservative European systematists as Britten & Rendle, Druce, Moss, Hartman, Rouy and Ascherson & Graebner, is abundant on the sandy and gravelly sea-shores from Newfoundland to Maine and very locally to Rhode Island, and casual on ballast southward. It is one of the maze of plants passing as *A. patula* and *A. hastata*. The latter, probably best considered as variations of one species, have the spiciform branches of the inflorescence naked except at base, the freely tuberculate bracteoles 1–5 mm. long (except in the rare *A. patula*, var. *bracteata* with bracteoles 1–1.5 cm. long), and the seeds 1–2 mm. in diameter. *A. glabriuscula*, on the other hand, has leafy-bracted inflorescences, large and less tuberculate fruiting bracteoles (0.5–1.2 cm. long) and seeds 2–4 mm. in diameter. In America *A. glabriuscula* is so clearly restricted to the region from Newfoundland to New England, where so many identities with the flora of north-western Europe are known, while the semi-cosmopolitan *A. patula* crosses the continent, that there is little question that we should recognize it as a distinct species. A few immature herbarium-specimens can-

not be satisfactorily placed but all fully mature specimens seem to be clearly either *A. patula* (including *A. hastata*) or *A. glabriuscula*. *A. glabriuscula*, at least in Nova Scotia, matures much earlier than *A. patula* and its var. *hastata*. The following American specimens are referred to

A. GLABRIUSCULA Edmonston. NEWFOUNDLAND: sea-beach, Middle Arm, Bay of Islands, August 22, 1896, *Waghorne*, no. 49; damp sandy shores, St. George's, August 13, 1910, *Fernald & Wiegand*, no. 3318. QUEBEC: marshy shore, Pointe au Maurier, Charnay, Saguenay Co., August 27, 1915, *St. John*, no. 90,408; sea-strand, Ile Herbée, Archipel du Vieux-Fort, July 24, 1915, *St. John*, no. 90,409; Anticosti, August 1, 1861, *Hyatt, Shaler & Verrill;* Anse au Sanatorium, Anticosti, August 20, 1917, *Fr. Marie-Victorin*. MAGDALEN ISLANDS: Brion Island, August 13, 1914, *St. John*, no. 1863; rivages, Ile du Hâvre-aux-Maisons, August 15, 1919, *FF. Marie-Victorin & Rolland-Germain*. NOVA SCOTIA: gravelly beach of Great Bras d'Or, Kidstone Island, August 28, 1920, *Fernald & Long*, nos. 21,149, 21,151; pebbly shore, Purcell's Cove, Halifax, September 2–6, 1901, *Howe & Lang*, no. 1503; damp sand-flats, Central Port Mouton, *Fernald, Bissell, Graves, Long & Linder*, no. 21,444; upper border of gravelly strand, Villagedale, August 7, 1920, *Fernald, Long & Linder*, no. 21,141; damp sand-flat back of beach, Sand Beach, Yarmouth Co., August 10 and September 7, 1920, *Fernald, Long & Linder*, nos. 21,142, 21,152; cobbly barrier beach, Pembroke Shore, July 5, 1920, *Long & Linder*, no. 21,140, October 6, *Fernald & Linder*, nos. 21,155, 21,156, 21,157. MAINE: railroad yard (introduced), Fort Fairfield, September 19, 1900, *Fernald;* strand, Pleasant Point, Perry, August 16, 1909, *Fernald;* strand, Carlow Island, Passamaquoddy Bay, August 16, 1909, *Fernald;* Cutler, August 27, 1902, *Kate Furbish;* Cross Island, August, 1892, *F. L. Harvey;* sandy beach, Great Wass Island, Jonesport, August 5, 1907, *Cushman & Sanford*, no. 1471; beach, Great Cranberry Isle, September 5, 1891, *Rand;* east shore of Little Cranberry Isle, August 6, 1889, *Redfield;* Sorrento, 1891, *Kate Furbish;* Swan's Island, August, 1911, *Kate Furbish;* Matinicus, 1918, *C. A. E. Long*, no. 64; open sand, sea-shore, Pemaquid Beach, Bristol, September 9, 1898, *Chamberlain;* gravelly shore, Southport, August 3, 1894, *Fernald;* Fort Popham, Phippsburg, September 7, 1907, *Kate Furbish;* Wells, 1898, *Kate Furbish*. MASSACHUSETTS: beach, Nahant, September 16, 1894, *Williams;* salt marsh, Seaview, October 4, 1896, *Williams;* beach near Eel River, Plymouth, September 23, 1853, *Wm. Boott;* southwestern section of Barnstable, September 16–17, 1918, *Bean, Bird & Knowlton*. RHODE ISLAND: Tiverton, September 27, 1903, *Williams;* seashore, Middletown, August 24, *M. B. Simmons*. PENNSYLVANIA: ballast, Greenwich Point, Philadelphia, August 25–October 1, 1874, *C. F. Parker*.

** A. PATULA L., var. BRACTEATA Westlund, Sveriges Atripl. 57 (1861); Moss, Cambr. Brit. Fl. ii. 174, t. 176 (1914). An extreme variation of northern Europe, with elongate bracteoles up to 1–1.5 cm. long, even longer than in *A. glabriuscula*, but with nearly naked inflorescence and small seed. Known in North America only from a single specimen collected in brackish or saline marsh near mouth of George River, Cape Breton.

SPERGULARIA SALINA J. & C. Presl.; Fernald & Wiegand, RHODORA, xii. 162 (1910). Occasional on saline shores.

S. LEIOSPERMA (Kindb.) F. Schmidt; Fernald & Wiegand, l. c. Occasional on saline shores.

SAGINA NODOSA (L.) Fenzl, var. PUBESCENS Mert. & Koch. Sand-flats, Queens and Shelburne Cos. See pp. 150, 158.

ARENARIA PEPLOIDES L., var. ROBUSTA Fernald, RHODORA, xi. 114 (1909). So far as we observed, on many beaches from Yarmouth to Cape Breton, this is the only variety of the species in the province.

STELLARIA ULIGINOSA Murr. Wet sand and springy spots at various stations in Digby and Victoria Cos.

S. LONGIFOLIA Muhl. COLCHESTER Co.: wet sandy margin of pool in flood-plain of Salmon River, Truro. Macoun reports the species as common but his records were based largely on the introduced weed, *S. graminea*.

* *Lychnis Flos-cuculi* L. Swale, Yarmouth.

** *Silene gallica* L. Railroad yard, Digby. Collected in the same locality in August, 1902, by the late Geo. E. Morris. See p. 94.

* *Dianthus Armeria* L. DIGBY Co.: rather scarce, on a clayey roadside bank, Sandy Cove.

* NYMPHOZANTHUS RUBRODISCUS (Morong) Fernald, RHODORA, xxi. 187 (1919). Lakes and quiet streams, Yarmouth Co. to Hants Co. Collected by Howe & Lang in Pictou Co. See p. 137.

* NYMPHAEA ODORATA Ait., var. ROSEA Pursh. See p. 161. Bog-pools and lake-margins, Digby and Yarmouth Cos.

BRASENIA SHREBERI Gmel. In various lakes of Yarmouth Co.

RANUNCULUS PURSHII Richardson. Shallow water and open swamps, Cumberland Co. to Cape Breton and Hants Co. See pp. 131, 133, 164, 170.

* R. FLAMMULA L.; Fernald, RHODORA, xix. 135 (1917). YARMOUTH Co.: in a cold spring-brook, Tusket. See p. 157.

R. ABORTIVUS L. Not seen west of Hants Co. See p. 133.

R. RECURVATUS Poir. Rich woods, Cumberland Co. to Cape Breton and Annapolis Co. See pp. 136, 164, 170.

Chelidonium majus L. About an old cellar-hole, Arcadia, Yarmouth Co.

Lepidium campestre (L.) R. Br. Waste land, Yarmouth.

* *L. Draba* L. Roadsides, waste places and ballast lands, Yarmouth, scarce. See p. 140.

Coronopus didymus (L.) Sm. Waste ground, railroad yards, etc., Digby, Yarmouth and Sand Beach (Yarmouth Co.). See p. 140.

* Subularia aquatica L. Sandy and gravelly bottoms of lakes. Yarmouth Co.: Jassy Lake, Lake Annis; Salmon (Greenville) L.; Clearwater L., Belleville; Frost L., Argyle; Great Pubnico L. Shelburne Co.: Clement Pond, Barrington. Victoria Co.: Warren L., Ingonish, *J. R. Churchill*. See pp. 142, 143, 151, 156.

* *Camelina microcarpa* Andrz. Casual weed of railroad yards.

* *Neslia paniculata* (L.) Desv. Casual weed of railroad yards and waste places, nowhere abundant but often seen in small quantity.

* *Conringia orientalis* (L.) Dumort. Casual in railroad yards.

* *Sisymbrium officinale* (L.) Scop. Occasional weed in Digby, Yarmouth and Queens Cos. Var. *leiocarpum* DC. was not seen. See p. 140.

* *Erisymum parviflorum* Nutt. Cumberland Co.: gravelly railroad yard, Springhill Junction. See p. 132.

Dentaria diphylla Michx. Annapolis Co.: brookside in mixed woods, southern slope of North Mt., near Middleton. Hants Co.: rich woods near gypsum cliffs aleng Five-Mile River. See pp. 137, 140, 170.

Drosera longifolia L. *D. intermedia* Hayne. The great abundance of this species in wet peaty and sandy soils from Yarmouth to Annapolis Co. makes it difficult to understand Dr. C. B. Robinson's belief that in Nova Scotia this species is restricted to Cape Breton (see p. 90).

** Drosera **longifolia** × **rotundifolia**, n. hybr., petiolis sparse pilosis, laminis late obovatis.

Petioles sparingly pilose; blades broadly obovate.—Nova Scotia: with the two parents and exactly intermediate between them, on a knoll in wet peaty slough in barrens, Lower Argyle, August 11, 1920, *Fernald, Bissell, Graves, Long* & *Linder*, no. 21,349 (type in Gray Herb.). See p. 155.

Tillaea aquatica L. Shelburne Co.: damp sand-flats back of beach, Villagedale. See p. 150.

Sedum acre L. Shelburne Co.: ledgy roadside, Barrington.

S. *stoloniferum* Gmel. Spreading to rocky or gravelly roadsides at many points in Digby, Yarmouth and Shelburne Cos. See p. 94.

S. roseum (L.) Scop. Digby Co.: basaltic cliffs by Bay of Fundy, Sandy Cove. See p. 163.

** Hamamelis virginiana L., var. parvifolia (Nutt.) T. & G. Fl. i. 597 (1840). A very striking extreme of the species with the comparatively small and thick leaves densely stellate-hirsute and usually rufescent beneath. Described by Nuttall from Pennsylvania, and cited by Torrey & Gray from Louisiana, but the shrub occurs northward into New England and Nova Scotia. The following are characteristic specimens. Nova Scotia: thickets bordering

Great Pubnico Lake, September 6, 1920, *Fernald, Long* & *Linder*, no. 21,395; bank of East Branch of Tusket River, Quinan, October 8, 1920, *Fernald* & *Linder*, no. 21,396. Maine: damp woods, Orono, September, 1887, *Fernald;* South Poland, October, 1893, *Furbish;* Brunswick, August 26, 1913, *Furbish*. Vermont: Rutland, October 3, 1898, *Eggleston*. Massachusetts: Georgetown, *C. N. S. Horner;* damp rocky woods, West Roxbury, October 10, 1896, *W. P. Rich;* low woods, Montague, May 11, 1912, *Wheeler* & *Wiegand*.

* Ribes hirtellum Michx., var. calcicola Fernald, Rhodora, xiii. 76 (1911). Commoner in Nova Scotia than the typical form of the species. The varietal designation a misnomer.

R. lacustre (Pers.) Poir. Swampy woods, Cumberland Co. to Hants Co. and Cape Breton.

R. triste Pallas, var. albinervium (Michx.) Fernald. Rich low woods, Cumberland Co. to Hants Co. and Cape Breton.

** Pyrus arbutifolia (L.) L. f. Frequent in Yarmouth Co.: sterile meadows, Arcadia; gravelly thicket by Salmon (Greenville) Lake; thicket by Butler's (Gavelton) L.; thicket by Great Pubnico L. Fruit cherry-red, maturing later than that of the commoner P. arbutifolia, var. atropurpurea (Britton) Robinson. See p. 156.

P. **dumosa** (Greene) n. comb. *Sorbus Aucuparia, β.* Michx. Fl. Bor.-Am. i. 290 (1803). *P. sambucifolia* of Eastern American records, not C. & S. *P. americana*, var. *decora* Sarg. Silva, xiv. 101 (1892). *S. dumosa* Greene, Pittonia, iv. 129 (1900). *S. scopulina* Greene, l. c. 130 (1900). *S. subvestita* Greene, l. c. (1900). *Pyrus sitchensis* Piper, Mazama, ii. 107 (1901) in part, not *Sorbus sitchensis* Roem. *S. decora* (Sarg.) Schneider, Bull. Herb. Boiss. sér. 2, vi. 313 (1906). —Apparently throughout, but less common than *P. americana*.

Sorbus sitchensis Roem. Syn. Mon. iii. 139 (1847), the nomenclatorial basis of *Pyrus sitchensis* (Roem.) Piper, with which our shrub and small tree has been recently identified, proves, according to Rehder, to be the *S. pumila* Raf. which was later described as *P. occidentalis* Watson. This species certainly has little to do with our large-fruited tree and shrub; but there seems to be no specific distinction between the common Rocky Mountain species and ours.

Frère Arsène has collected on Miquelon a hybrid of *P. americana* with *P. arbutifolia*, var. *atropurpurea*. Similar hybrids of *P. americana* or the introduced *P. Aucuparia* with *P. arbutifolia* and *P. melanocarpa* are occasionally found in New England. Such frequent occurrences of natural hybrids between these species, which are considered by many authors as distinct genera (*Sorbus* and *Aronia*) would seem to weaken the line of separation between these "genera."

** Amelanchier stolonifera Wiegand, Rhodora, xiv. 144 (1912). Apparently not common in the province. Annapolis Co.: boggy depressions and moist thickets on sandy plains, Middleton.

** A. STOLONIFERA Wiegand, var. **lucida**, n. var., foliis crassis supra atroviridibus lucidis; ovario ad apicem glabro vel sparse pubescente.

Leaves thick, dark green and lustrous above: ovary glabrous at apex or only sparsely pubescent.—NOVA SCOTIA: dry rocky and gravelly railroad right-of-way, west of Bridgewater, July 17, 1920, *Fernald, Bissell, Pease, Long* & *Linder*, no. 21,432; slaty ledges and cobbly upper beach of Shubenacadie Grand Lake, July 19, *Fernald* & *Bissell*, no. 21,433; dry open barrens, Springhill Junction, July 18, *Pease* & *Long*, no. 21,434; dryish open sandy plain, Middleton, July 20, *Fernald, Pease* & *Long*, no. 21,435, *Bean* & *White*, no. 21,436; moist woods and thickets, Middleton, July 21, *Fernald* & *Pease*, no. 21,437 (TYPE in Gray Herb.); boggy barrens west of Goose Lake, Argyle, August 4, *Fernald* & *White*, no. 21,438; boggy barrens near Clement Pond, Barrington, August 9, *Fernald, Long* & *Linder*, no. 21,439. For further discussion see pp. 130, 135, 138.

** A. CANADENSIS (L.) Medic.; Wiegand, RHODORA, xiv. 150 (1912). HANTS CO.: talus of gypsum cliffs, Five-Mile River. See pp. 136, 170.

** A. LAEVIS Wiegand, var. **nitida** (Wiegand), n. comb. *A. laevis*, forma *nitida* Wiegand, RHODORA, xiv. 155 (1912).

This green- and lustrous-leaved extreme is so characteristic and uniform on the wooded terraces of Sissiboo River, Weymouth (nos. 21,441, 21,442) that it seemed to all members of the party who saw it a very distinct shrub. Also collected in mixed woods on the southern slope of North Mountain, Middleton, *Long*, no. 21,447.

** A. INTERMEDIA Spach; Wiegand, RHODORA, xxii. 147 (1920). Wet or dry open soil, thickets, borders of woods, etc. Common, at least from Yarmouth to Hants and Queens Cos. See p. 103.

** CRATAEGUS JONESAE Sargent. QUEENS CO.: hillside pasture, Bell Point, Port Mouton. See p. 159.

FRAGARIA VESCA L., var. AMERICANA Porter. HANTS CO.: talus of gypsum cliffs near Five-Mile River. VICTORIA CO.: rock faces and crevices of gypsum cliffs, Port Bevis. See pp. 136, 170.

* *Potentilla recta* L. DIGBY CO.: dry open fields, Digby.

P. FRUTICOSA L. YARMOUTH CO.: open spruce bog near Cedar Lake. DIGBY CO.: wet savannah along Little River east of Tiddville; dry clayey roadside, Sandy Cove. HANTS CO.: talus of gypsum cliffs near Five-Mile River. See p. 01.

* *P. Anserina* L., var. *sericea* Hayne. See Fernald, RHODORA, xi. 8 (1909). Naturalized in waste ground about wharves at Yarmouth.

P. procumbens Sibth. YARMOUTH CO.: along path in spruce and alder thicket, Lower Argyle. VICTORIA CO.: grassy road through spruce and fir woods, Baddeck. See p. 155.

** *Filipendula hexapetala* Gilib. Roadside thicket, Yarmouth.

* *F. Ulmaria* (L.) Maxim. Abundantly naturalized by roadsides about Yarmouth.

Geum canadense Jacq. Frequent in rich soil about towns, often appearing like an introduced weed. See p. 137.

G. virginianum L. Not seen west of Annapolis Co. See pp. 137, 170.

G. strictum Ait. Frequent from Annapolis Co. eastward. See p. 137.

Rubus idaeus L. See Fernald, Rhodora, xxi. 96 (1919). Well established as a garden escape about Yarmouth.

R. idaeus, var. strigosus (Michx.) Maxim.; Fernald, l. c. Frequent but apparently less common than the next.

R. idaeus, var canadensis Richardson; Fernald, l. c. 97. Frequent.

R. Chamaemorus L. Common on boggy barrens of the Atlantic slope, rare elsewhere. Digby Co.: Tiddville.

R. allegheniensis Porter. Common in dry thickets and clearings eastward at least to Halifax and Pictou Cos.

** R. glandicaulis Blanchard, var. **neoscoticus**, n. var., a forma typica recedit caulibus crassioribus; foliis supra breviter villosis, subtus densissime subvelutinis; pedicellis crassioribus rectis.

Differing from the typical form of the species in its stouter canes: leaves short-villous above, very densely almost velvety beneath: pedicels stouter, straight.—Yarmouth County, Nova Scotia: recently burned clearing near Beaver Lake, July 11, 1920, *Fernald, Bissell, Pease, Long* & *Linder*, no. 21,600; roadside thicket, Wellington, July 11, 1920, *Fernald, Bissell, Pease, Long* & *Linder*, no. 21,569 (type in Gray Herb.); rocky roadside thicket, Yarmouth, September 7, 1920, *Fernald, Long* & *Linder*, no. 21,603; abundant in and around Yarmouth, July 25, 1909, *W. H. Blanchard*, nos. 718, 719; dryish thickets, Sand Beach, July 12, 1920, *Fernald* & *Linder*, no. 21,543; dry thickets and borders of woods, Belleville, July 27, 1920, *Long* & *Linder*, no. 21,549; rocky clearing west of Eel Lake, July 27, 1920, *Fernald, Bean* & *White*, no. 21,579.

In its best development var. *neoscotica* has grayish foliage dull above, lustrous beneath, and the leaflets, especially of the new canes so full as to appear puckered or strongly rugose. Typical R. glandicaulis, which was collected by Blanchard at Granville, Annapolis Co. (no. 717), and which is frequent in southern New Brunswick and on Prince Edward Island, is a more slender plant, with the leaves glabrous and shining above, pubescent but hardly lustrous beneath, and its pedicels almost capillary and usually upwardly arching. Material from Canso (*Fowler*) is somewhat transitional.

** R. orarius Blanchard, Rhodora, viii. 169 (1906). Frequent in damp thickets of Digby, Yarmouth and Shelburne Cos. Markedly

less pubescent than *R. alleghaniensis*, though with the lower leaf-surfaces thinly velvety; the racemes (except at tip of cane) copiously leafy-bracted, and the sparingly glandular pedicels more often with scattered bristles; in these characters closely matching the series of Blanchard's Cape Porpoise specimens designated by him as the type. Heretofore known from York Co., Maine and from Cape Cod, Massachusetts. DIGBY CO.: rich moist open thicket by brook, Sandy Cove, *Fernald* & *Long*, nos. 21,589, 21,592, 21,602. YARMOUTH CO.: gravelly shore of Lake Annis, *Bissell, Pease* & *Linder*, no. 21,568; open woods and thickets near Butler's (Gavelton) Lake, Gavelton, *Fernald, Long* & *Linder*, no. 21,609; damp rocky thicket, Pubnico, *Fernald, Long* & *Linder*, no. 21,613. SHELBURNE CO.: rocky spruce and alder thickets, and dry gravelly slopes, Shag Harbor, *Fernald, Bissell* & *Linder*, nos. 21,581, 21,617 and 21,628.

R. ANDREWSIANUS Blanchard. YARMOUTH CO.: open rocky woods and thickets near Butler's (Gavelton) Lake, Gavelton, *Fernald, Long* & *Linder*, no. 21,540; moist clearing in spruce woods near Randel Lake, Argyle, *Long* & *Linder*, no. 21,624.

** R. AMNICOLA Blanchard, RHODORA, viii. 170 (1906) as *R. amnicolus*. The type collection is well matched by our material from DIGBY CO.: gravelly railroad bank, Digby, *Bissell, Pease, Long* & *Linder*, no. 21,625.

Brainerd & Peitersen treat *R. amnicola* as a hybrid of *R. argutus* and *R. canadensis*. As yet no typical *R. argutus* has been found in Nova Scotia, the nearest approach to it being *R. Andrewsianus* which they consider a hybrid of *R. alleghaniensis* and *R. argutus*.

R. CANADENSIS L. Common throughout the province.

R. MULTIFORMIS Blanchard. Blanchard included different plants under this name. The typical species is a very distinct low-arching or trailing, freely branching and "tipping" shrub, with remotely prickly coarse canes, glabrous leaves with caudate-tipped leaflets and very lax and elongate racemes (suggesting those of *R. elegantulus*), the filiform pedicels not bristly. The following Nova Scotia material closely matches Blanchard's type series. KINGS CO.: Kentville, *Blanchard*, no. 726. ANNAPOLIS CO.: Annapolis, *Blanchard*, no. 727. DIGBY CO.: thickets bordering savannahs by Little River, Tiddville, *Fernald* & *Long*, no. 21,576; thickets and steep wooded banks along Sissiboo River, Weymouth, *Fernald, Bissell, Graves, Long* & *Linder*, no. 21,537; moist mixed woods and thickets, Meteghan, *Fernald* & *Long*, no. 21,560; clearings in wet spruce woods, Meteghan, *Fernald* & *Long*, no. 21,562. YARMOUTH CO.: low woods and thickets by Butler's (Gavelton) Lake, Gavelton, *Fernald, Long* & *Linder*, no. 21,590; boggy clearings and borders of spruce woods, Pubnico, *Fernald, Long* & *Linder*, no. 21,611; thicket bordering Great Pubnico Lake, *Fernald, Long* & *Linder*, no. 21,539. QUEENS CO.: gravelly thicket near mouth of Broad River, *Fernald* & *Bissell*, no. 21,621.

This species may prove to be an extreme of *R. elegantulus*.

** R. BIFORMISPINUS Blanchard. SHELBURNE Co.: rocky spruce and alder thickets, Shag Harbor, *Fernald, Bissell* & *Linder*, no. 21,618.

** R. RECURVANS Blanchard. YARMOUTH Co.: upper border of cobbly beach of Tusket (Vaughan) Lake, Gavelton, *Fernald, Long* & *Linder*, no. 21,618; rocky clearing west of Eel Lake, *Fernald, Bean* & *White*, no. 21,578.

R. RECURVICAULIS Blanchard, RHODORA, viii. 153 (1906). Apparently throughout the province. The following are referred here. VICTORIA Co.: fencerows, thickets and borders of woods, Baddeck, *Fernald* & *Long*, no. 21,573. GUYSBOROUGH Co.: Boylston, *Hamilton*, no. 19,985 (Geol. Surv. Can. as *R. canadensis*). HALIFAX Co.: Purcell's Cove, Halifax Harbor, *Howe* & *Lang*, no. 1578 (as *R. Randii*); Dartmouth, *Blanchard*, nos. 735, 736. QUEENS Co.: dry border of woods, Port Mouton, *Fernald, Long* & *Linder*, no. 21,601. SHELBURNE Co.: spruce and maple swamp by Clement Pond, Barrington, *Fernald, Long* & *Linder*, no. 21,623. YARMOUTH Co.: gravelly thicket bordering Salmon (Greenville) Lake, *Fernald, Long* & *Linder*, no. 21,620; gravelly railroad embankment, Yarmouth, *Fernald, Long* & *Linder*, no. 21,605. DIGBY Co.: dry open field, Digby, *Bissell, Pease, Long* & *Linder*, no. 21,626. ANNAPOLIS Co.: dryish open sandy plains, Middleton, *Fernald, Pease* & *Long*, nos. 21,547, 21,597, 21,598.

Rydberg in the North American Flora (xxii. 474, 475) assigns *R. procumbens* Muhl. a range from "Maine to Virginia," etc., but treats *R. recurvicaulis*, which is common in Nova Scotia and Newfoundland, as *R. pergratus* × *procumbens*. In view of the fact that neither *R. pergratus* nor *R. procumbens* is known in either Nova Scotia or Newfoundland *R. recurvicaulis* would seem, by Rydberg's interpretation, to be one of the *absent treatment* hybrids so popular with many students of *Rubus*. Rydberg includes other such supposed hybrids on the same page (in view of the fact that *R. procumbens* is unknown from east of southern Maine): "*R. canadensis* × *procumbens* . . . Nova Scotia and Maine" and "*R. hispidus* × *procumbens* . . . . Nova Scotia to Vermont and Long Island, New York."

I have been unable to separate from *R. recurvicaulis*, Blanchard's *R. arenicola*, RHODORA, viii. 151 (1906) as *R. arenicolus*. See p. 138.

R. PLICATIFOLIUS Blanchard, RHODORA, viii. 149 (1906). YARMOUTH Co.: swampy woods and wet thickets by Eel Lake, *Fernald, Bean* & *White*, no 21,580.

* R. JUNCEUS Blanchard. YARMOUTH Co.: sphagnous swale bordering Beaver Lake, *Fernald, Bissell, Pease, Long* & *Linder*, no. 21,556.

R. VERMONTANUS Blanchard, Am. Bot. vii. 1 (1904). DIGBY Co.: moist thicket, Sandy Cove, *Fernald* & *Long*, no. 21,591; open sphagnous bog and moist thickets, Meteghan, *Fernald* & *Long*, nos. 21,550, 21,561; dry banks along railroad, Hectanooga, *Bissell*, *Pease* & *Linder*, no. 21,588. YARMOUTH Co.: peat bog, Pembroke Shore, *Long* & *Linder*, no. 21,627; dryish thickets, Sand Beach, *Fernald* & *Linder*, no. 21,544. SHELBURNE Co.: rocky spruce and alder thickets, Shag Harbor, and rocky railroad bank, Wood Harbor, *Fernald*, *Bissell* & *Linder*, nos. 21,582, 21,616½, and 21,639.

This material is a perfect match for Blanchard's original specimens from York County, Maine, of *R. peculiaris*, a plant which is rightly referred by Brainerd & Peitersen to *R. vermontanus*. Rydberg (No. Am. Fl. xxii. 477) treats *R. peculiaris* as a hybrid of *R. nigricans* (apparently *R. setosus* Bigel.) and *R. pergratus*, but until *R. pergratus* is found in western Nova Scotia, where *R. peculiaris* (or *R. vermontanus*) is frequent, such a disposition of it there would seem hardly satisfactory. Incidentally, *R. pergratus* has the leaves velvety beneath and coarse prickles, *R. peculiaris* glabrous leaves and fine almost bristle-like prickles.

R. TARDATUS Blanchard. One of the most characteristic "half-high" species of damp thickets. CUMBERLAND Co.: gravelly thickets south of Amherst, *Fernald*, no. 21,586. HALIFAX Co.: thicket bordering ledgy and cobbly beach of Shubenacadie Grand Lake, *Fernald* & *Bissell*, nos. 21,553, 21,556. ANNAPOLIS Co.: Middleton, *Blanchard*, no. 732. DIGBY Co.: clearings in wet spruce woods, Meteghan, *Fernald* & *Long*, no. 21,564. YARMOUTH Co.: sphagnous swale bordering Beaver Lake, *Fernald*, *Bissell*, *Pease*, *Long* & *Linder*, no. 21,571; thicket at border of sandy and peaty beach, Trefry's Lake, Arcadia, *Fernald* & *Long*, no. 21,606; low woods and thickets by Butler's (Gavelton) Lake, Gavelton, *Fernald*, *Long* & *Linder*, no. 21,608; thicket bordering Great Pubnico Lake, *Fernald*, *Long* & *Linder*, no. 21,612. See p. 156.

Since *R. tardatus* is a dominant and very constant species of boggy thickets and lake-margins of Nova Scotia and of Prince Edward Island, Brainerd & Peitersen's treatment of it as "*R. flagellaris* × *setosus*" seems hardly satisfactory. *R. flagellaris* is unknown from east of southern Maine and *R. setosus* is not known from Prince Edward Island (the material so referred in the 7th edition of Gray's Manual being wrongly determined) and the only plant we have from Nova Scotia which is possibly referable to it is wholly uncharacteristic and may belong to another species.

** R. ABBREVIANS Blanchard. YARMOUTH Co.: rocky roadsides and borders of woods, Yarmouth, *Pease* & *Long*, no. 21,585, *Fernald*, *Bean* & *White*, no. 21,545, *Fernald*, *Long* & *Linder*, no. 21,557.

More glandular and less bristly than the characteristic shrub of the upland region of New Hampshire and Vermont but seemingly referable to it. A plant of Annapolis Co.: moist woods and thickets, Middleton, *Fernald* & *Pease*, no. 21,541, is less characteristic but is temporarily referred here.

* Rubus setosus Bigel. Our only Nova Scotian material which is possibly referable to *R. setosus* is from Digby Co.: border of clearing in wet mixed woods, Hectanooga, *Long* & *Linder*, no. 21,577, a remarkably stout development, with long canes 7 mm. in diameter and with unusually firm and thickened bristles, perhaps not correctly referred to *R. setosus*.

R. arcuans Fernald & St. John, Proc. Bost. Soc. Nat. Hist. xxxvi. 78, t. 2, fig. 7 (1921). To the Nova Scotia stations originally published should be added the following. Annapolis Co.: Granville, *Blanchard*, no. 728 (as *R. biformispinus*). Yarmouth Co.: gravelly bank, Yarmouth, *Pease* & *Linder*, no. 21,584; gravelly roadside near Saller Lake, Kemptville, *Fernald* & *Linder*, no. 21,538.

** R. jacens Blanchard. Common in southern Digby and Yarmouth Cos. Digby Co.: moist thicket, Meteghan, *Fernald* & *Long*, no. 21,551. Yarmouth Co.: rocky and gravelly woods and thickets bordering Cedar Lake, *Fernald, Bissell, Pease, Long* & *Linder*, no. 21,599; damp to dryish roadside thickets, Yarmouth, *Fernald, Bean* & *White*, no. 21,546; gravelly railroad embankment, Yarmouth, *Fernald, Long* & *Linder*, no. 21,558; dry gravelly railroad embankment, Arcadia, *Pease* & *Long*, no. 21,542; gravelly thicket, Lower Argyle, *Fernald, Bissell, Graves, Long* & *Linder*, no. 21,619.

Treated by Brainerd & Peitersen as "*R. hispidus* × *setosus*." The abundance of characteristic *R. jacens* in western Nova Scotia, where *R. setosus* is excessively rare if not quite unknown, suggests that the former is now, at least, a well established species.

R. hispidus L. Common throughout.

R. hispidus, var. major Blanchard, Rhodora, viii. 213 (1906). Yarmouth Co.: rocky roadside thicket, Yarmouth, *Fernald, Long* & *Linder*, no. 21,604.

Alchemilla vulgaris L.; Fernald & Wiegand, Rhodora, xiv. 232 (1912). A very abundant and rapidly spreading weed of fields and roadsides in Digby, Yarmouth and Shelburne Cos.; not eaten by browsing animals. See p. 94.

Agrimonia gryposepala Wallr. Less common than A. striata Michx., but found in rich thickets and woods from Digby Co. to Cape Breton. See p. 146.

** *Rosa rugosa* Thunb. This familiar hardy rose, now well naturalized on the coast of New England, is likewise becoming established at Yarmouth.

Prunus serotina Ehrh. Frequent from Halifax Co. westward.

* *Lupinus polyphyllus* Lindl. See Fernald, RHODORA, xvi. 94 (1914). Very abundantly naturalized on dry roadside banks, Chebogue Point, and less abundantly at other places in Yarmouth Co. Well naturalized along gravel of Salmon River, Truro. Beginning to spread from cultivation at Baddeck. See p. 105.

L. nootkatensis Donn. See Fernald, l. c. With the preceding in great abundance at Chebogue Point, Yarmouth Co. See p. 105.

** *Trifolium pratense* L., var. *frigidum* Gaudin. YARMOUTH CO.: seepy open peaty slopes, Yarmouth. See p. 95.

** *T. dubium* Sibth. YARMOUTH CO.: roasides, Darling Lake, Arcadia and Belleville. See p. 101.

** *Vicia angustifolia* (L.) Reichard, var. *uncinata* (Desv.) Rouy & Foucaud; Fernald & Wiegand, RHODORA, x'i. 140 (1910). Waste places about Yarmouth. Becoming wel. naturalized also in eastern Maine, New Brunswick, Prince Edward Island and Newfoundland. See p. 95.

LATHYRUS PALUSTRIS L. See Fernald, RHODORA, xiii. 50 (1911). QUEENS CO.: damp dune-thicket, Central Port Mouton. The plant generally passing as *L. palustris* is var. PILOSUS (Cham.) Ledeb.

L. PALUSTRIS, var. MACRANTHUS (T. G. White) Fernald, RHODORA, l. c. ANNAPOLIS CO.: crests of basalt cliffs by Bay of Funday, Margaretville.

* *L. pratensis* L. CUMBERLAND CO.: border of boggy swale, Springhill Junction. See p. 132.

APIOS TUBEROSA Moench. YARMOUTH CO.: thickets bordering Salmon (Greenville) Lake; thicket bordering beach of Butler's (Gavelton) L., Gavelton. QUEENS CO.: damp thicket, Central Port Mouton. HALIFAX CO.: gravelly thicket bordering Shubenacadie Grand Lake. See p. 147.

AMPHICARPA MONOICA (L.) Ell. HALIFAX CO.: thicket bordering beach of Shubenacadie Grand Lake.

* *Geranium pratense* L. Waste ground, Yarmouth. Collected in 1913 in dry fields, Springville, Pictou Co. (*St. John*, no. 1431).

* *Euphorbia hirsuta* (Torr.) Wiegand. Railroad gravel, Weymouth and North Sydney. Doubtless more general along the railroads.

CALLITRICHE HETEROPHYLLA Pursh. All our collections of *Callitriche* from Yarmouth Co. are of this species, no *C. palustris* being noted southwest of Annapolis Co. *C. heterophylla* was collected at various stations throughout the province.

COREMA CONRADII Torr. Already well known from dry plains and barrens of Halifax, Kings and Annapolis Cos. Frequent in appropriate habitats in Yarmouth, Shelburne and Queens Cos. See pp. 92, 137, 138, 142, 148, 150.

ILEX VERTICILLATA (L.) Gray. The Black Alder is so exceedingly variable that it often seems as if some definite specific lines should

be found in the group. I have spent much time in studying the seeds from all ripe fruit at hand in the hope that these would furnish sound characters, but, although the seeds show great diversity in size (2.8–4.5 mm. long) and outline, these variations seem to be in no way associable with other characters or with definite ranges. Besides the typical form of the species, which is common in Nova Scotia, the following recognizable varieties occur.

** I. VERTICILLATA, var. PADIFOLIA (Willd.) T. & G. Queens Co.: wet boggy thickets near Louis Lake, Port Joli. See p. 159.

I. VERTICILLATA, var. TENUIFOLIA (Torr.) Wats. Yarmouth Co.: moist, rocky wooded slope, Tusket. Halifax Co.: cool damp woods, Windsor Junction, *Howe & Lang*, no. 415.

** I. VERTICILLATA (L.) Gray, var. **fastigiata** (Bicknell), n. comb. *I. fastigiata* Bicknell, Bull. Torr. Bot. Cl. xxxix. 426 (1912).—Yarmouth Co.: swampy spruce woods and thickets, southwest shore of Trefry's Lake, Arcadia; gravelly thicket by Fanning Lake, Carleton; thicket bordering Great Pubnico Lake (less characteristic form). See p. 109.

I. GLABRA (L.) Gray. Frequent or common, often dominant in spruce woods, bogs and on wet or dry barrens, Digby and Yarmouth Cos. to Halifax Co. See pp. 91, 97, 98, 105, 110, 142. 148, 158, 159, 161.

* Acer rubrum L., var. tridens Wood. Occasional from Yarmouth Co. to Queens Co. See pp. 102, 151.

Rhamnus alnifolia L'Hér. Cumberland Co.: openings in swampy woods, Springhill Junction.

Hypericum boreale (Britton) Bicknell. Common throughout the province.

** H. dissimulatum Bicknell, Bull. Torr. Bot. Cl. xl. 610 (1913). Yarmouth Co.: boggy swale, Tusket Falls; wet moss, Argyle Head. Halifax Co.: gravelly beach of Third Lake, Windsor Junction. See p. 149.

** Elatine minima (Nutt.) Fisch. & Meyer; Fernald, Rhodora, xix. 13 (1917). Shallow water at sandy, muddy or gravelly margins of lakes, common in Digby, Yarmouth and Shelburne Cos. In the tidal mud of the Tusket, fruiting when only 2–3 mm. high.

Although here recorded for the first time in Canada, *E. minima* was collected by *Fernald, Long & St. John* (no. 7765) in 1912 in Lake Verde, Prince Edward Island.

Lechea intermedia Leggett. Common in dry open soil in most silicious regions. See p. 138.

Viola cucullata Ait., forma prionosepala (Greene) Brainerd, Rhodora, xv. 112 (1913). Commoner than the glabrous form in Yarmouth Co.

* V. cucullata, var. microtitis Brainerd, l. c. Digby Co.:

mixed woods, Hectanooga. YARMOUTH Co.: wet thickets and woods, Yarmouth.

V. SEPTENTRIONALIS Greene. Common throughout the province.

V. FIMBRIATULA Sm. Dry open soil, Yarmouth Co. to Annapolis and Halifax Cos. See p. 138.

V. PRIMULIFOLIA L. Damp sand, gravel and peat, Yarmouth and Shelburne Cos. See p. 150.

V. INCOGNITA Brainerd. Common in wet woods and thickets.

V. INCOGNITA, var. FORBESII Brainerd, Bull. Torr. Bot. Cl. xxxviii. 8 (1911). Common, usually in drier or upland woods.

V. RENIFOLIA, var. BRAINERDII (Greene) Fernald, RHODORA, xiv. 88 (1912). Rich or calcareous woods from Annapolis Co. to Cape Breton.

V. ERIOCARPA Schwein., var. **leiocarpa** Fernald & Wiegand, n. var., **ovariis capsulisque glabris.**

Ovaries and capsules glabrous.—Eastern Quebec to Minnesota, south to North Carolina, Tennessee, Missouri and Kansas. TYPE: Breezy Point, Warren, New Hampshire, July 21, 1907, *E. F. Williams* in Gray Herb.

In Britton & Brown's *Illustrated Flora*, ed. 2, ii. 559, Brainerd takes up the name *Viola eriocarpa* Schwein. as the earliest specific name for the plant he had formerly called *V. scabriuscula* Schwein. and describes it as having "capsule ovoid, woolly or sometimes glabrous." This description of the fruit is certainly in accord with the specific name but it is doubtful if most botanists of the northernmost states and adjacent Canada would recognize it as applying to the common yellow violet of rich woods, which they have been accustomed to call *V. scabriuscula*. In the Maritime Provinces, Quebec, New England and New York the authors have never seen *V. eriocarpa* except with glabrous ovary and capsule; but a single specimen in the herbarium of the New England Botanical Club from Hartford County, Connecticut (Tariffville, *Winslow & Hill*) shows that the plant with woolly capsule rarely occurs in the Northeast. We have examined 154 sheets of the species in which the ovary or capsule is displayed. In 12 sheets (1 from Connecticut, 2 from the same station in Maryland, 1 from southern Ontario, 2 from Indiana, 1 from Illinois, 1 from Minnesota, 1 from Kansas, and 3 from Oklahoma) the ovary or capsule is woolly; in 2 sheets (1 from Indiana, 1 from Wisconsin) some plants have woolly, some glabrous capsules; while 140 sheets (6 from Quebec, 2 from New Brunswick, 1 from Nova Scotia, 24 from Maine, 21 from New Hampshire, 14 from Vermont, 27 from Massachusetts, 1 from Rhode Island, 8 from Con-

necticut, 5 from New York, 9 from Pennsylvania, 2 from the District of Columbia, 1 from West Virginia, 1 from Virginia, 1 from North Carolina, 1 from Indiana, 2 from Tennessee, 2 from Michigan, 1 from Wisconsin, 3 from Illinois, 1 from Minnesota, 1 from Iowa, 5 from Missouri, and 1 from Kansas) have the ovary or capsule strictly glabrous. Mr. Walter Deane informs us that in his extensive herbarium there is only one sheet of *V. eriocarpa* (and that a number from Oklahoma already checked in the Gray Herbarium) with pubescent capsules. It is thus apparent that the more widely dispersed plant has glabrous capsules and, extending far to the northeast of the nomenclatorially typical *V. eriocarpa*, is worthy varietal separation.[1]

Rather local in Nova Scotia; probably confined to the calcareous districts. Hants Co.: alluvial woods along Five-Mile River. Nichols's report of *V. canadensis* (Veg. No. Cape Breton, 283) as characterizing the climax forest of Cape Breton was based on *V. eriocarpa*, var. *leiocarpa*.

V. conspersa Reichenb. Occasional from Digby Neck to Cape Breton.

Shepherdia canadensis (L.) Nutt. To the already recorded stations on Cape Breton may be added: rock-faces and crevices of gypsum cliffs, Port Bevis. See pp. 164, 170.

** Decodon verticillatus (L.) Ell., var. laevigatus T. & G.; Fernald, Rhodora, xix. 154 (1917). Shelburne Co.: quaking peaty margin of Clement Pond, Barrington. See p. 150.

Lythrum Salicaria L. Colchester Co.: low ground by railroad, Truro.

* Rhexia virginica L. Yarmouth Co.: wet thicket-margin by Randel Lake, Argyle; sandy shore of Great Pubnico L.; peaty margin of Kegeshook L. See pp. 149, 167, 168.

Epilobium palustre L. Wet thickets and swamps, from Annapolis and Queens Cos. eastward.

E. palustre, var. monticola Haussk. Common throughout, in open bogs and damp peaty barrens.

* E. glandulosum Lehm., var. occidentale (Trel.) Fernald, Rhodora, xx. 35 (1918). Queens Co.: damp dune-thicket, Central Port Mouton, very scarce.

Circaea latifolia Hill; Fernald, Rhodora, xix. 87 (1917). *C. Lutetiana* of American authors, not L. Hants Co.: alluvial woods along Five-Mile River. See pp. 137, 170.

C. canadensis Hill; Fernald, Rhodora, l. c. *C. intermedia* Ehrh. Hants Co.: alluvial woods along Five-Mile River. See pp. 137, 170.

[1] Since the above was written, Mr. C. A. Weatherby has reported to us the typical woolly-podded *V. eriocarpa* from 2 additional stations in Connecticut.

Myriophyllum alterniflorum DC. Colchester Co.: shallow pool, flood-plain of Salmon River, Truro. See p. 133.

M. exalbescens Fernald, Rhodora, xxi. 120 (1919). Brackish water, Cape Breton: Sydney Mines and Baddeck.

M. verticillatum L., var. pectinatum Wallr. Cumberland Co.: spring-pools south of Amherst. See p. 131.

* M. Farwellii Morong. Digby Co.: muddy cove in Lily Lake, Sandy Cove. See p. 163.

* M. humile (Raf.) Morong. Valley of the Tusket River, Yarmouth Co.: peaty, sandy and muddy shores, pond-hole near head of St. John Lake, Springhaven, passing in deep water to forma natans (DC.) Fernald; tidal flats, Tusket Falls. See p. 105.

M. tenellum Bigel. Shallow water at sandy or peaty lake-margins of Yarmouth and Digby Cos. Nichols's record of *M. humile* from Cape Breton belongs here. See pp. 105, 141, 142, 143, 163.

Proserpinaca palustris L. Yarmouth Co.: boggy swales and savannahs about Tusket (Vaughan) and Butler's (Gavelton) Lakes. See p. 165.

** × P. intermedia Mackenzie, Torreya, x. 250 (1910). Yarmouth Co.: boggy savannah by Butler's (Gavelton) Lake, Gaveton. Here as at several stations in Massachusetts and Rhode Island growing with *P. palustris* and *P. pectinata* and obviously a fertile hybrid of them. See p. 166.

** P. pectinata Lam. Yarmouth Co.: wet savannah bordering Butler's (Gavelton) Lake, Gavelton; boggy savannah bordering St. John Lake, Springhaven; peaty and muddy dried-out pond-hole near head of St. John Lake. See pp. 165, 168.

Hippuris vulgaris L. Yarmouth Co.: shallow pool, Pembroke Shore. Cumberland Co.: spring-pools south of Amherst.

Aralia racemosa L. Rich or calcareous wooded slopes, Hants Co. to Cape Breton. See p. 170.

Sanicula marilandica L. Hants Co.: alluvial woods along Five-Mile River. Cumberland Co.: swampy woods, Springhill Junction.

* S. gregaria Bicknell. Hants Co.: alluvial woods along Five-Mile River. See pp. 137, 170.

Hydrocotyle americana L. Common in Yarmouth Co.

Osmorhiza Claytoni (Michx.) Clarke. Rich, alluvial or calcareous woods, Annapolis Co. to Cape Breton. See p. 170.

O. divaricata Nutt. Annapolis Co.: brookside in mixed woods, southern slope of North Mountain, north of Middleton. Victoria Co.: open woods about bases of gypsum cliffs, Port Bevis. See pp. 140, 170.

Conium maculatum. Waste ground, Digby.

* *Levisticum officinale* (L.) Koch. Yarmouth Co.: railroad bank, Lake Annis.

** Lilaeopsis lineata (Michx.) Greene. Yarmouth Co.: rocky and muddy tidal banks of Tusket River, Tusket. See p. 110.

Coelopleurum lucidum (L.) Fernald, Rhodora, xxi. 146 (1919). Apparently common on gravelly or rocky sea-shores. See p. 99.

Conioselinum chinense (L.) BSP. Queens Co.: mossy spruce woods near mouth of Broad River. See p. 159.

Cornus rugosa Lam. *C. circinata* L'Hér. See Rehder, Rhodora, xii. 122 (1910). Open woods and talus about gypsum cliffs. Hants Co.: Five-Mile River. Victoria Co.: Port Bevis.

C. stolonifera Michx. Common from Hants Co. eastward.

* C. Amomum Mill. Victoria Co.: thicket along cold brook in woods at head of Baddeck Bay, Baddeck. See p. 164.

C. alternifolia L. f. Common from northern Digby Co. to Cape Breton. Rare in Yarmouth Co.: rocky woods near Eel Lake.

Chimaphila umbellata (L.) Nutt., var. cisatlantica Blake, Rhodora, xix. 241 (1917). Rare and local in the western counties; only scattered sterile plants found.

Pyrola secunda L., var. obtusata Turcz. Digby Co.: sphagnous spruce swamp, Hectanooga. See p. 146.

P. chlorantha Sw.; Fernald, Rhodora, xxii. 51 (1920). Annapolis Co.: mixed woods, southern slope of North Mountain, north of Middleton.

P. chlorantha, var. paucifolia Fernald, Rhodora, l. c. With the last.

** P. rotundifolia L., var. arenaria Mert & Koch; Fernald, Rhodora, xxii. 122 (1920). Infrequent in the silicious areas. Yarmouth Co.: border of dry spruce woods, Belleville. Digby Co.: open pasture, Hectanooga. Annapolis Co.: damp *Polytrichum*-covered sandy plains, Middleton. See pp. 97, 138.

P. rotundifolia L., var. americana (Sweet) Fernald, Rhodora, xxii. 122 (1920). Rare in the western counties; seen only at one station in Yarmouth Co.: wooded knoll in barrens west of Goose Lake, Argyle.

** Rhododendron canadense (L.) Torr., forma viridifolium Fernald in Wilson & Rehder, Mon. Azal. 122 (1921). Yarmouth Co.: a few scattered colonies in boggy thickets bordering Trefry's Lake, Arcadia. See p. 145.

Arctostaphylos Uva-ursi (L.) Spreng., var. coactilis Fernald & Macbride, Rhodora, xvi. 212 (1914). Noted in the western counties only on the silicious areas from Lunenburg Co. to southern Yarmouth Co.

THE GRAY HERBARIUM EXPEDITION TO NOVA SCOTIA, 1920.

M. L. Fernald.

(*Continued from p. 278.*)

Gaylussacia dumosa (Andr.) T. & G., var. Bigeloviana Fernald, Rhodora, xiii. 99 (1911). Common in boggy barrens and in sphagnous bogs, Yarmouth Co. to Halifax Co.; Cumberland Co.; and collected by others on Cape Breton. See pp. 99, 132, 148.

In Newfoundland, Nova Scotia and New England, where *G. dumosa*, var. *Bigeloviana* is distinctively a shrub of wet bogs and sphagnous pond-margins, it seems specifically distinct from typical *G. dumosa* which occurs from Virginia to the Gulf States, where the species is characteristic of dry barrens. In typical *G. dumosa* the upper surfaces of the leaves and of the bracts of the inflorescences are scarcely if at all glandular, the corolla is 5–7 mm. long and the anthers are 2.8–3.5 mm. long, while in the more northern var. *Bigeloviana* the upper surfaces of leaves and bracts are copiously glandular, the corollas are 8–9 mm. long, and the anthers 4–5 mm. long. In order to test these characters in an intermediate area I have borrowed, through the kindness of Mr. Bayard Long, the material of the Philadelphia Academy, including the remarkable collection of the Philadelphia Botanical Club. A careful study of this extensive collection (about 60 sheets) from New Jersey, Delaware and eastern Pennsylvania shows that, while in a large proportion of cases typical *G. dumosa* and its var. *Bigeloviana* are readily distinguished in New Jersey and the adjacent region, there are too many cases in which the characters break down to allow the elevation of var. *Bigeloviana* to specific rank. Thus material from New Texas, Lancaster Co., Pennsylvania, with the copious glandularity of the northern shrub, has the small corolla (6.5–7 mm. long) and the small anthers (about 3 mm.) of the southern; or material from Speedwell, New Jersey, with almost no glands on the foliage, has the large corolla (8.3 mm. long) and the long anthers (4.7 mm.) of the northern very glandular shrub, while almost glandless material from Manchester, New Jersey, has the longest corolla seen (9 mm.). It is clear, then, that, although very definite from southern New England to Newfoundland, var. *Bigeloviana* in New Jersey and eastern Pennsylvania passes by various transitions into typical *G. dumosa*.

Vaccinium vacillans Kalm. Yarmouth Co.: upper border of cobble-beach of Butler's (Gavelton) Lake, Gavelton. See p. 166. Recorded with doubt by Lindsay.

* V. corymbosum L., var. amoenum (Ait.) Gray. Boggy thickets, spruce swamps and lake-margins, common in southern Digby and Yarmouth Cos.; the foliage commonly lustrous and glabrous except for being hirsute on the veins beneath, but sometimes strictly glabrous and often as densely pubescent as in *V. atrococcum* and sometimes as small as in *V. pennsylvanicum*. The berries are commonly blue with a bloom but occasionally as black as in *V. atrococcum*. See pp. 97, 98, 109.

V. CORYMBOSUM, var. PALLIDUM (Ait.) Gray. DIGBY Co.: wet woods and thickets, Meteghan; swampy thickets and woods by Little Doucette Lake, Hectanooga. YARMOUTH Co.: boggy thickets bordering Trefry's Lake, Arcadia.

PRIMULA FARINOSA L., var. MACROPODA Fernald. ANNAPOLIS Co.: crests of basalt cliffs by Bay of Fundy, near Margaretville. See p 139.

*SAMOLUS FLORIBUNDUS HBK. YARMOUTH Co.: rocky and muddy tidal banks of Tusket River, extending up-stream to Tusket Falls; brackish muddy and gravelly margin of Eel Lake. See pp. 105, 142.

Lysimachia punctata L. Thoroughly naturalized by roadsides in most parts of the province. See p. 95.

STEIRONEMA CILIATUM (L.) Raf. Seen in the western counties only at one station in YARMOUTH Co.: alder thicket, Yarmouth.

**SABATIA KENNEDYANA Fernald, RHODORA, xviii. 150, t. 121 (1916). YARMOUTH Co.: apparently general in the Tusket Valley, above the lower tidal reaches: peaty margin of Kegeshook Lake; very abundant on boggy savannah bordering St. John L., Springhaven; sandy and gravelly margin of Pearl L., Kemptville; wet pockets in sandy and cobbly beach of Fanning L., Carleton; peaty and gravelly border, northwest side of Tusket (Vaughan) L. (flowering plants wholly submerged by high water); wet savannah bordering Butler's (Gavelton) L., Gavelton. See pp. 158, 160, 165, 167.

Macoun recorded *S. chloroides* Pursh (a southern relative of *S Kennedyana*) as on Sable Island, but St. John states (Proc. Bost. Soc. Nat. Hist. xxxvi. 89) that Macoun's material is *Centaurium umbellatum*.

BARTONIA VIRGINICA (L.) BSP. Common in western Nova Scotia. Our collections are as follows. YARMOUTH Co.: cobbly beaches of East Branch of Tusket and of Butler's Lake, Gavelton; open spot in rocky woods near Eel L.; sandy and peaty bog, Sand Pond, Argyle; dry rocky open thickets near Randel L., Argyle; dryish peaty barrens, Lower Argyle. SHELBURNE Co.: dry rocky or gravelly barrens near Clement Pond, Barrington. QUEENS Co.: dry blueberry barrens near Louis L., Port Joli; openings in dryish thickets, Port Mouton; boggy thickets and border of swale, Central Port Mouton. ANNAPOLIS Co.: damp *Polytrichum*-covered sandy plains, Middleton. Recorded by J. M. Macoun, Ottawa Nat. xxiii. 192 (1910) from Lunenburg Co. See pp. 138, 148, 154, 157, 159.

B. PANICULATA (Michx.) Robinson. As already stated (pp. 149, 153, 156), *B. paniculata*, as it occurs in Nova Scotia, is tremendously variable and clearly passes into plants which closely approach the Newfoundland *B. iodandra*. As a result of prolonged but not wholly

satisfying study the following treatment is proposed as the best I can yet arrive at.

Calyx cleft nearly or quite to base: corolla-lobes lanceolate to narrowly oblong, sharply acuminate or at least acute.
Plant yellowish-green, rarely purplish: inflorescence thyrsoid or a simple raceme: leaves and calyx-lobes firm, subulate to linear-lanceolate, yellowish-green or at most purple-tipped: flowers 2.5–5 mm. long: corolla-lobes mostly creamy-white, lance-acuminate, 0.7–1.5 mm. broad: anthers mostly yellowish.....*B. paniculata* (typical)
Plant purplish or fulvous: inflorescence a simple raceme, rarely subpaniculate: leaves and calyx-lobes fleshy or herbaceous; the latter deeper green to purple, lanceolate to oblong: flowers 3.8–6 mm. long: corolla-lobes often purple-tipped or watery-white, lance-oblong, 1.2–2 mm. broad: anthers mostly purple.....Var. *intermedia*.
Calyx cleft (at least on one side) only two-thirds or three-fourths to base; its lobes herbaceous, oblong to ovate: corolla-lobes petaloid, oblong to narrowly ovate, blunt or merely acutish, 1–2 mm. broad.
Racemes simple or dichotomous: pedicels clavate: 2 or 3 calyx-lobes distinct to base: corolla 3–5 mm. long, creamy-white: anthers mostly yellowish.....Var. *sabulonensis*.
Racemes mostly simple: pedicels filiform: calyx-tube 1–2 mm. long: corolla 4–7 mm. long, often purple-tinged: anthers mostly purple.....Var. *iodandra*.

** B. PANICULATA (typical). Wet bogs, sphagnous quagmires, peaty and wet cobbly shores. YARMOUTH Co.: Jassy Lake, Lake Annis; Pembroke Shore; Porcupine L. and Trefry's L., Arcadia; Butler's (Gavelton) L., Gavelton; Sand Pond, Randel L. and Goose L., Argyle; wet barrens, Lower Argyle; St. John L., Springhaven. QUEENS Co.: near Louis L., Port Joli; near mouth of Broad River.

** B. PANICULATA, var. **intermedia**, n. var., plantis purpurascentibus vel fulvescentibus; racemis simplicibus laxis, pedicellis elongatis; foliis calycibusque herbaceis fulvo-viridibus vel purpurascentibus; lobis calycis distinctis lanceolatis vel oblongis; floribus 3.8–6 mm. longis; lobis corollae ochroleucis purpureo-tinctis vel translucentibus lanceolato-oblongis 1.2–2 mm. latis; antheris purpurascentibus. Widely distributed in Nova Scotia. RICHMOND Co.: L'Ardoise, August, 1892, *Walter Faxon*. DIGBY Co.: wet peaty hollows in savannahs along Little River, Tiddville, August 22, 1920, *Fernald & Long*, no. 22,299 (TYPE in Gray Herb.). YARMOUTH Co.: boggy wood-road, Pembroke Shore, October 6, *Fernald & Linder*, no. 22,973: boggy swale by Tusket River, Tusket Falls, August 20, *Fernald, Bissell, Graves, Long & Linder*, no. 22,298; cobble-beach of Butler's (Gavelton) Lake, Gavelton, September 4, *Fernald, Long & Linder*, no. 22,303; sphagnous bog near Argyle station, August 4, *Long & Linder*, no. 22,285; quagmire-pools in barrens near Goose Lake, Argyle, August 4, *Fernald & White*, no. 22,282; wet peaty sloughs in barrens, Lower Argyle, August 11, *Fernald, Bissell, Graves, Long & Linder*, no. 22,287; boggy roadside, Pubnico, September 6, *Fernald*,

Long & *Linder*, no. 22,306. Queens Co.: wet sphagnous spruce bog near Louis Lake, Port Joli, August 17, *Fernald*, *Long* & *Linder*, no. 22,296; springy sphagnous bog in spruce woods near mouth of Broad River, August 16, *Fernald* & *Bissell*, no. 22,292.

Several collections from eastern Massachusetts to New Jersey are closely similar but less fleshy or herbaceous and with the anthers only tending to purplish, or at first reddish then changing to yellow. These seem to be transitional to var. *intermedia* but not so well defined as the Nova Scotian material.

Var. **sabulonensis** (Fernald), n. comb. *B. iodandra*, var. *sabulonensis* Fernald in St. John, Proc. Bost. Soc. Nat. Hist. xxxvi. 89 (1921). The plant of Sable Island is also on the mainland. We have the following collections. Yarmouth Co.: wet sandy and rocky shore of Lake Annis; wet lower peaty and cobbly beach and sphagnous swales bordering Salmon (Greenville) Lake; boggy swale by Tusket River, Tusket Falls; cobbly margin of East Branch of Tusket, Gavelton (transitional to typical *B. paniculata*); wet sandy shore of Great Pubnico Lake.

Var. **iodandra** (Robinson), n. comb. *B. iodandra* Robinson, Bot. Gaz. xxvi. 47 (1898).—Known only from Newfoundland.

* Apocynum medium Greene. Halifax Co.: slaty ledges and cobbly upper beach of Shubenacadie Grand Lake.

A. cannabinum L. Gravels along Shubenacadie R. and Five-Mile R. (Hants).

** Asclepias incarnata L., var. **neoscotica**, n. var., caulibus 3–5 dm. altis, glabris vel sparsissime pilosis; foliis 7–11-jugis ovato-oblongis obtusis vel subacutis glabris vel subtus ad nervos sparsissime setulosis, longioribus 4.5–6.5 cm. longis.—Nova Scotia: wet, lower, gravelly beach of Shubenacadie Grand Lake, July 19, 1920, *Fernald* & *Bissell*, no. 22,318 (type in Gray Herb.); gravelly margin, northwest side of Tusket (Vaughan) Lake, August 20, 1920, *Fernald, Bissell, Graves, Long* & *Linder*, no. 22,319.

Differing from *A. incarnata* in its very short and broad leaves; from var. *pulchra* (Ehrh.) Pers. in its few and short, glabrous or glabrate leaves; var. *pulchra* having 11–21 pairs of longer (the longest 0.9–1.8 dm. long) leaves copiously hairy beneath. See pp. 135, 160.

* *Collomia linearis* Nutt. *Gilia linearis* (Nutt.) Gray. Casual by the railroad, Truro; probably adventive from the Baie des Chaleurs region where abundant and seemingly native.

Lappula echinata Gilib. Waste land, railroad yards, etc., apparently frequent, but nowhere abundant.

* *Symphytum asperum* Lepechin; Macbride, Rhodora, xviii. 23 (1916). *S. asperrimum* Donn. Yarmouth Co.: waste land, Yarmouth.

** Mertensia maritima (L.) S. F. Gray, forma **albiflora**, n. f., corollis albidis.

Corollas whitish.—NOVA SCOTIA: gravelly barrier beach, Sand Beach, Yarmouth Co., July 12, 1920, *Fernald* & *Linder*, no. 22,349 (TYPE in Gray Herb.). See p. 102.

VERBENA HASTATA L. Not seen west of Hants Co.

TEUCRIUM CANADENSE L., var. LITTORALE (Bickn.) Fernald. Gravelly coast of YARMOUTH Co.: Rockville; Eel Lake; Argyle. On Sable Island and the eastern coast of New Brunswick and southwestern coast of Prince Edward Island. See p. 142.

Nepeta hederacea (L.) Trevisan. We have two well-marked varieties of *Nepeta hederacea* introduced into North America. Typical *N. hederacea* with the corolla 1.6–2.2 cm. long is apparently rare in eastern Canada. I have seen it from Charlottetown, Prince Edward Island and from a cellarhole at Arcadia, Nova Scotia (*Pease* & *Long*, no. 22,366). The commoner plant of eastern Canada has the corolla 1–1.5 cm. long and its leaves are inclined to be red or reddish. This is

N. hederacea, var. *parviflora* (Benth.) Druce, Brit. Pl. 57 (1908).

Judging from the representation before me the two varieties are not uniformly distributed in northeastern America, the representation of specimens from Newfoundland to New England being as follows. NEWFOUNDLAND: type, 0; var. *parviflora*, 2. QUEBEC: type, 0; var., 1. PRINCE EDWARD ISLAND: type, 1; var., 1. NEW BRUNSWICK: type, 0; var., 2. NOVA SCOTIA: type, 1; var., 6. MAINE: type, 5; var. 11. NEW HAMPSHIRE: type, 3; var., 4. VERMONT: type, 6; var., 2. MASSACHUSETTS: type, 27; var., 18. RHODE ISLAND: type, 0; var., 11. CONNECTICUT: type, 6; var., 2.

Stachys palustris L. Roadside ditches, Sand Beach (Yarmouth) and Barrington and collected by others about various ports eastward.

True *S. palustris* of Europe is clearly only an introduced plant in eastern America, occurring about ports, on waste land, in ditches, etc. from southeastern Newfoundland and Gaspé Co., Quebec to Ottawa, south, chiefly near the coast, to New Jersey. In this introduced plant the calyx bears stipitate glands mixed with the long glandless hairs and the pubescence of the stem is short and appressed on the sides, longer on the angles. The indigenous plant of alluvial thickets, river terraces and other rich soil from the Penobscot Valley in Maine to Ontario and southward is var. *homotricha* Fernald, in which the calyx lacks stipitate glands and the pubescence of the sides of the stem is elongate, often as long as on the angles.

** LYCOPUS UNIFLORUS Michx., forma **flagellaris**, n. f., apicibus caulis ramorumque valde elongatis flagelliformibus deinde radicantibus.

Tips of the stem and branches much elongated, flagelliform, finally rooting.—NOVA SCOTIA: sandy and cobbly margin of Pottle's Lake, North Sydney, August 30, 1920, *Bissell & Linder*, no. 22,387 (TYPE in Gray Herb.).

L. UNIFLORUS, var. OVATUS Fernald & St. John, Proc. Bost. Soc. Nat. Hist. xxxvi. 92 (1921). YARMOUTH Co.: upper border of cobble-beach, Salmon (Greenville) Lake. See p. 156.

** *Linaria vulgaris* L., forma **leucantha**, n. f., corollis palato luteo excepto lacteis.

Corollas, except for the yellow palate, whitish.—NOVA SCOTIA: railroad embankment south of Amherst, July 18, 1920, *Fernald*, no. 22,407 (TYPE in Gray Herb.). See p. 131.

L. minor (L.) Desf. A characteristic railroad weed, Springhill Junction to Elmsdale (Hants); also Sydney Mines. See p. 132.

L. canadensis (L.) Dumont. Seen by us only as a railroad weed.

LIMOSELLA SUBULATA Ives. YARMOUTH Co.: rocky and muddy tidal banks of Tusket River, Tusket. SHELBURNE Co.: damp sand-flats back of beach, Villagedale. CAPE BRETON Co.: brackish shore, Sydney Mines. See pp. 110, 150.

GRATIOLA AUREA Pursh. Gravelly and sandy lake-shores and dryish savannahs, common in Yarmouth and southern Digby Cos. See pp. 102, 157.

Veronica longifolia L. Abundantly naturalized in roadside-thickets about towns, Yarmouth, Digby and Annapolis Cos. See p. 95.

AGALINIS NEOSCOTICA (Greene) Fernald, RHODORA, xxiii. 139 (1921). Common in damp or exsiccated sandy or peaty open soil, Yarmouth, Digby and Annapolis Cos. Nova Scotian records of *Gerardia purpurea* and *G. paupercula* belong here. See pp. 138, 139, 161.

EUPHRASIA PURPUREA Reeks, var. RANDII (Robinson) Fernald & Wiegand, RHODORA, xvii. 188 (1915). Frequent in turfy soil or on borders of thickets near the coast. Often the white-flowered forma ALBIFLORA Fernald & Wiegand, l. c. See pp. 99, 139.

E. CANADENSIS Townsend; Fernald & Wiegand, l. c. 195. YARMOUTH Co.: dry rocky open thickets near Randel Lake, Argyle; exsiccated roadside, Pubnico. SHELBURNE Co.: pastured open woods, Villagedale; recently burned clearing and grassy roadsides, Barrington. See p. 149.

E. AMERICANA Wettst. Common throughout, on roadsides and in sterile fields.

E. stricta Host; Fernald & Wiegand, l. c. 197. SHELBURNE Co.: pastured open woods, Villagedale; grassy roadside, Barrington.

* UTRICULARIA GEMINISCAPA Benj. *U. clandestina* Nutt. Common in bog-pools and peaty quagmires. Our stations are as follows. YARMOUTH Co.: barrens near Goose Lake, Argyle; near head of Abram River; St. John Lake, Springhaven. DIGBY Co.: Tiddville;

Centerville. SHELBURNE Co.: Villagedale; Barrington. VICTORIA Co.: Kidstone Island, Great Bras d'Or Lake. See pp. 142, 161.

* U. MINOR L. In shallow pools or films of water or in lake-margins. YARMOUTH Co.: Beaver Lake; Tusket Falls. DIGBY Co.: Little River, Tiddville. HANTS Co.: Five-Mile River. HALIFAX Co.: Shubenacadie Grand Lake.

* U. GIBBA L. YARMOUTH Co.: shallow margin and small pools in beach of Jassy Lake, Lake Annis. See p. 143.

U. INTERMEDIA Hayne. Apparently common, but rarely flowering. See p. 141.

* U. PURPUREA Walt. DIGBY Co.: quiet pools in Little River and pond-holes in savannah east of Tiddville. YARMOUTH Co.: deep water of Trefry's Lake, Arcadia; Butler's (Gavelton) L., Gavelton; Kegeshook L. See pp. 145, 161.

* U. RESUPINATA B. D. Greene. DIGBY Co.: muddy margin of Midway (Centerville) Lake, Centerville. See p. 163.

** U. SUBULATA L. Characteristic of wet sandy and peaty lake-margins of Yarmouth and southern Digby Cos. Our stations are as follows: Cedar Lake; Beaver L.; Jassy L., Lake Annis; Salmon (Greenville) L.; Trefry's L., Arcadia; Butler's (Gavelton) L., Gavelton; Clearwater L., Belleville; Randel L. and Sand Pond, Argyle; Great Pubnico L. Always growing with and clearly passing into

** U. SUBULATA L., forma **cleistogama** (Gray), n. comb. *U. subulata*, var. *cleistogama* Gray, Syn. Fl. N. A. ii. pt. 1. 317 (1878). *U. cleistogama* (Gray) Britton, Trans. N. Y. Acad. Sci. ix. 12 (1889). *Setiscapella cleistogama* (Gray) Barnhart in Britton & Brown, Ill. Fl. ed. 2, iii. 231 (1913). See pp. 100, 108, 142, 143, 169.

GALIUM TRIFIDUM L. Springy and boggy spots, locally throughout, much less common than G. CLAYTONI Michx. and G. PALUSTRE L.

* G. TRIFIDUM, var. HALOPHILUM Fernald & Wiegand, RHODORA, xii. 78 (1910). Brackish shores and borders of salt marshes. YARMOUTH Co.: Chebogue. VICTORIA Co.: Kidstone Island. CAPE BRETON Co.: Sydney Mines. See p. 105.

* G. TINCTORIUM L. YARMOUTH Co.: thickets and swales bordering Salmon (Greenville) Lake; boggy swale by Tusket River, Tusket Falls. See p. 104.

Earlier records of *G. tinctorium* from Nova Scotia seem to belong to the common G. PALUSTRE L.

** *Lonicera Periclymenum* L. The European Woodbine, one of the glories of Yarmouth arbors, is becoming naturalized in roadside fence-rows.

VIBURNUM ALNIFOLIUM Marsh. Not seen south of Digby Neck. See pp. 134, 136.

V. OPULUS L., var. AMERICANUM (Mill.) Ait. Occasional from Cumberland and Hants Counties to Cape Breton. See p. 137.

Valeriana officinalis L. Occasional escape to roadsides.

** Eupatorium verticillatum Lam. acc. to Wiegand, Rhodora, xxii. 62 (1920) = E. purpureum L. acc. to Mackenzie, ibid. 165 (1920). Yarmouth Co.: cobbly or bushy borders of Salmon (Greenville) Lake; sandy and rocky border of Tusket River, Tusket Falls; gravelly margin of Tusket (Vaughan) Lake; sandy and cobbly beach of Fanning L., Carleton. See p. 147.

I do not undertake to settle which name should be applied to this coastal plain species. The very fact that two such students as Wiegand and Mackenzie, after prolonged and independent study of the literature, should arrive at such different conclusions is sufficient indication that the identity of the Linnean species cannot be finally settled without close comparisons by someone, who thoroughly understands the plants involved, of the various critical specimens in the Old World herbaria.

E. maculatum L. acc. to Wiegand, l. c. 64 (1920) = E. Bruneri Gray, acc. to Mackenzie, l. c. (1920). Rich thickets and swales, Digby Neck to Halifax Co. and Cape Breton.

Solidago latifolia L. Locally in rich woods or on calcareous slopes, Digby Neck to Cape Breton. See pp 164, 170

S. bicolor L. Rare or wanting in the southwest; not seen in Shelburne, Yarmouth and southern Digby Cos.

S. uniligulata (DC.) Porter. Abundant on wet or dryish peaty barrens[1]. Macoun's records of *S. uliginosa* and *S. racemosa* ("*S. humilis*") belong here. There are other records of *S. uliginosa* but I have seen no material from Nova Scotia. See p. 157.

S. juncea Ait. Not seen in Queens, Shelburne and Yarmouth Cos.

S. nemoralis Ait. Rare or wanting in the southwest; not seen in Queens and Shelburne Cos., and seen in Yarmouth Co. only at Carleton. Seeming to prefer argillaceous soil.

** S. Elliottii T. & G. Abundant, often dominant, in boggy clearings, swales, damp thickets, spruce and maple swamps and lake shores, Yarmouth Co. eastward at least to Queens. See pp. 144, 151, 157, 169.

* S. rugosa Mill., var. villosa (Pursh) Fernald. Apparently frequent throughout.

[1] Too much of the Nova Scotian material is intermediate between *S. uniligulata* and *S. neglecta* T. & G. In Massachusetts, too, these plants are not specifically separable and it seems that Gray was correct in treating them as varieties of one species. Since, however, *S. uniligulata* antedates *S. neglecta* they should be combined under the former not under the latter name, which was retained by Gray. The varieties of *S. uniligulata* are as follows.

S. uniligulata (DC.) Porter, var. **terrae-novae** (T. & G.), n. comb. *S. Terrae-Novae* T. & G. Fl. N. A. ii. 206 (1842).

Var. **neglecta** (T. & G.), n. comb. *S. neglecta* T. & G. l. c. 213 (1842).

** S. RUGOSA, var. SPHAGNOPHILA Graves. Occasional in spruce swamps and savannahs, Yarmouth and Shelburne Cos. See p. 151.

S. CANADENSIS L. Rare and local in Yarmouth, Shelburne and Queens Cos. Common farther east. See pp. 143, 151.

* S. SEROTINA Ait. VICTORIA CO.: moist thicket near mouth of Bevis Brook, Port Bevis. See p. 170.

S. SEROTINA, var. GIGANTEA (Ait.) Gray. YARMOUTH CO.: gravelly thicket by Fanning Lake, Carleton. ANNAPOLIS CO.: railroad bank, Middleton.

S. GRAMINIFOLIA (L.) Salisb. Sandy or gravelly shores and damp thickets, apparently throughout. Less common than var. NUTTALLII (Greene) Fernald. See p. 157.

** S. TENUIFOLIA Pursh. YARMOUTH CO.: sandy roadside, Sloane Lake, Pleasant Valley. HALIFAX CO.: gravelly beach of Third Lake, Windsor Junction. See p. 160.

** S. TENUIFOLIA, var. **pycnocephala**, n. var., caulibus simplicibus vel subsimplicibus superne vix ramosis 3–7 dm. altis; foliis crassis lineari-oblongis vel lineari-lanceolatis obtusis vel acutiusculis vix attenuatis valde adscendentibus nec patentibus nec revolutis, mediis 2–5 cm. longis 2–6 mm. latis; corymbis densissime glomerulatis vel glomerulis segregatis 1–5 cm. diametro; involucris valde glutinosis turbinato-hemisphaericis, bracteis apice viridibus glanduloso-ciliatis; ligulis plerumque oblongis.—Peaty, gravelly or sandy margins of lakes, Yarmouth, Shelburne and Queens Counties, NOVA SCOTIA. The following are characteristic. SHELBURNE CO.: shallow water at sandy and cobbly margin of Clement Pond, Barrington, August 9, 1920, *Fernald, Long* & *Linder*, no. 22,736. YARMOUTH CO.: sandy and peaty margin of Great Pubnico Lake, September 6, *Fernald, Long* & *Linder*, no. 22,746; shallow water at rocky margin of Goose Lake, Argyle, August 4, *Fernald* & *White*, no. 22,735; rocky margin of Randel Lake, Argyle, August 4, *Long* & *Linder*, no. 22,734; wet gravelly margin of Butler's (Gavelton) Lake, Gavelton, September 2, 1920, *Fernald* & *Long*, no. 22,744; cobbly margin of East Branch of Tusket River, Gavelton, September 4, *Fernald, Long* & *Linder*, no. 22,745; sandy and cobbly beach of Fanning L., Carleton, October 7, *Fernald* & *Linder*, no. 22,741; boggy savannah bordering St. John Lake, Springhaven, October 8, *Fernald* & *Linder*, no. 22,742; peaty and cobbly margin of Salmon (Greenville) Lake, July 31, *Fernald* & *White*, no. 22,733; wet lower peaty and cobbly beach of Salmon (Greenville) Lake, August 13, *Fernald, Bissell, Graves, Long* & *Linder*, no. 22,743 (TYPE in Gray Herb.); sandy and peaty beach of Trefry's Lake, Arcadia, July 15, *Fernald* & *Pease*, no. 22,727, July 29, *Fernald* & *Long*, no. 22,732; cobbly margin of Darling Lake, October 6, *Fernald* & *Linder*, no. 22,738.

Differing from typical *S. tenuifolia* in its simple habit; erect, very thick, firm, broad, short and obtuse or merely acutish leaves; its

very compact and small inflorescence; and more glutinous involucre, with often broader bracts, the outer with dark-green summits and glandular-ciliate margins. In typical *S. tenuifolia* the stem is freely branched above, forming a loose corymb up to 4 dm. broad; the leaves linear-attenuate and sharply acute, thin and inclined to become revolute, the primary ones 4–9 cm. long, 1.5–4 mm. broad; the often only slightly glutinous, though sometimes extremely gummy, involucres commonly with slightly narrower bracts with less pronounced green tips and margins only slightly ciliolate; and the rays usually a little narrower. See pp. 143, 144, 170.

Too many collections, however, show direct transitions in all these characters to allow the specific separation of the Nova Scotian plant. The material from Cedar Lake (nos. 22,726, 22,728, 22,729, and 22,739), collected by different parties at remote points on the shore, has all the character of the heads of extreme var. *pycnocephala;* but the leaves, though firm and ascending, are slenderly attenuate, the primary ones 3.5–7 cm. long, and most of the material is freely branching and with loose corymbs. Other collections (that from Darling Lake above cited, and from lakes at Kemptville), though simple or subsimple, have the leaves slenderly attenuate; while a large colony on dry sand at Sloane Lake, near Pleasant Valley (no. 22,748) is very typical *S. tenuifolia.* Farther south, much of the pond-margin and quagmire material from Cape Cod, though with the foliage of typical *S. tenuifolia,* has heads too close to those of var. *pycnocephala;* while the plants of the Saco valley in Maine and New Hampshire, as well as some from Cape Cod, are often simple or subsimple.

** Aster macrophyllus L., var. velutinus Burgess. Frequent from Yarmouth Co. to Queens.

A. radula Ait. One of the commonest plants of boggy barrens, peaty swales and damp thickets.

* A. vimineus Lam. Digby Co.: thickets and steep wooded banks of Sissiboo River, Weymouth.

* A. vimineus, var. saxatilis Fernald. Yarmouth Co.: gravelly margin of Tusket (Vaughan) Lake; cobble-beach of Butler's (Gavelton) L., Gavelton; boggy savannah bordering St. John L., Springhaven. Digby Co.: sandy beach of Lily L., Sandy Cove.

A. junceus Ait. Yarmouth Co.: wet savannah bordering Butler's (Gavelton) Lake, Gavelton.

A. longifolius Lam. Frequent on shores of lakes and streams.

* A. foliaceus Lindl.; Fernald, Rhodora, xvii. 13 (1915). At scattered stations in Yarmouth and Digby Cos. Flowering earlier

than *A. longifolius* and *A. novi-belgii*, our flowering material collected July 6–25.

A. NEMORALIS Ait. Dominant on peaty barrens, bogs and lake-margins, Digby and Yarmouth Cos. to southern Guysborough Co. and Cape Breton. See p. 90.

A. NEMORALIS, var. MAJOR Peck, N. Y. State Mus. Rep. xlvii. 155—reprint, 29 (1894). Var. *Blakei* Porter, Bull. Torr. Bot. Cl. xxi. 311 (July 20, 1894). See p. 156. Frequent in wet woods, thickets and moist clearings, of similar range to the last.

On p. 156 I gave the date of publication of var. *major* as Jan., 1894. Dr. H. D. House has since informed me that the date of publication is very uncertain. "The State Printer records indicate that the report was received for printing March 1st . . . it is extremely unlikely that the printing was accomplished before July 1st."

ERIGERON HYSSOPIFOLIUS Michx. Crevices and talus of gypsum-cliffs, Five-mile River (Hants) and Port Bevis (Victoria). See pp. 64, 136, 170.

* E. PHILADELPHICUS L. DIGBY CO.: damp roadside, Hectanooga.

ANTENNARIA PETALOIDEA Fernald, var. SUBCORYMBOSA Fernald RHODORA, XVI. 133 (1914). YARMOUTH CO.: dry gravelly railroad embankment, Arcadia. ANNAPOLIS CO.: dry sandy thickets and borders of woods, Middleton. HANTS CO.: dry open gravelly banks of Five-mile River. COLCHESTER CO.: seepy slope, Truro.[1] See p. 103.

[1] A close ally of *A. petaloidea* which demands recognition is

ANTENNARIA **appendiculata,** n. sp. Planta laxe humifusa, stolonibus flagelliformibus ad 1 dm. elongatis apice foliatis; foliis basilaribus spathulato-obovatis 1.5–3 cm. longis 0.5–1.1 cm. latis, supra laxe canescenti-tomentosis 1-nerviis; caule florifero 1.5–2.5 dm. alto albido-tomentoso; foliis caulinis 6–9 apice appendiculatis, appendicula scariosa plana colorata 3.5–5 mm. longa; capitulis femineis 1–6 corymbosis; involucro 8–11 mm. alto; bracteis 3–4-seriatis, exterioribus 4–6 mm. longis oblongis obtusis vel subtruncatis plus minusve fulvo- vel purpureo-maculatis, interioribus lanceolato-attenuatis gilvis paulo fimbriatis; corollis 5.3–5.6 mm. longis; stylo flavescente ramibus 0.5 mm. longis; achaeniis 1.2 mm. longis papillosis; setis pappi longioribus 7–8 mm. longis; **planta mascula ignota.**

Plant loosely humifuse: the stolons flagelliform, up to 1 dm. long, leafy at tip: rosette-leaves spatulate-obovate, 1.5–3 cm. long, 0.5–1.1 cm. wide, loosely canescent-tomentose above, 1-nerved: flowering stem 1.5–2.5 dm. high: **cauline leaves 6–9, terminated by a flat scarious** colored appendage 3.5–5 mm. long: pistillate heads 1–6, corymbose: involucre 8–11 mm. high: bracts 3–4-seriate; the outer 4–6 mm. long, oblong, obtuse or subtruncate, more or less brown- or purple-blotched; inner lance-attenuate, creamy, a little fimbriate: corollas 5.3–5.6 mm. long; style yellowish, its branches 0.5 mm. long: achenes 1.2 mm. long, papillose: longer pappus-bristles 7–8 mm. long: staminate plant unknown. QUEBEC: dry wooded knolls, banks of the Grand River, Gaspé Co., June 30–July 3, 1904, *Fernald*, distributed as *A. petaloidea* (TYPE in Gray Herb.).

Quickly distinguished from the more southern and western *A. petaloidea* by the flat scarious appendages which terminate most of the cauline leaves.

A. CANADENSIS Greene. Apparently frequent throughout.

A. NEODIOICA Greene. Common.

** A. NEODIOICA, var. GRANDIS Fernald. YARMOUTH Co.: damp rocky barren north of Tusket (Vaughan) Lake. DIGBY Co.: dryish gravelly bank, Meteghan; dry open bank near Little River, east of Tiddville. HANTS Co.: spruce woods along Five-mile River. See p. 98.

.** A. NEODIOICA, var. **chlorophylla**, n. var., a forma typica recedit *A. petaloidea* throughout its range has the middle and upper cauline leaves tipped by a firm subulate-aristate appendage, only the very uppermost or bracteal with the appendage flattened; and when well developed it is taller and with full corymbs of 5–15 heads.

Typical *A. petaloidea*, which occurs from Rimouski Co., Quebec, westward and southward, has the basal leaves spatulate to spatulate-obovate and rounded at apex; the cauline leaves at regularly decreasing intervals up to the inflorescence; and the branches of the corymb or the pedicels mostly 0.1–3 cm. long. Var. *subcorymbosa*, which occurs from eastern Newfoundland, and Prince Edward Island to southeastern Maine and Nantucket, has the basal leaves oblanceolate and acute or acutish; the flowering stem nearly or quite without leaves for a distance of 0.7–1.7 dm. below the inflorescence and the branches of the corymb or the pedicels elongate (the lower often 0.5–1.7 dm. long). Professor Wiegand has called my attention to a characteristic plant of west-central New York which has the basal leaves of var. *subcorymbosa* but the short flowering-stem and more approximate cauline leaves of typical *A. petaloidea*. This plant is so characteristic of much of New York state that it may be called

A. PETALOIDEA, var. **noveboracensis,** n. var., foliis basilaribus oblanceolatis vel anguste obovatis acutis 1.5–4 cm. longis 0.5–1.2 cm. latis; caule florifero 0.4–2.3 dm. alto regulariter foliato; corymbo subconferto, ramibus pedicellisque brevibus; bracteis involucri petaloideis.

Basal leaves oblanceolate or narrowly obovate, acute, 1.5–4 cm. long, 0.5–1.2 cm. broad: flowering stem 0.4–2.3 dm. high, regularly leafy: corymb rather crowded; its branches and pedicels short: involucral bracts petaloid. —NEW YORK: along Beaver Brook, south of McLean, Dryden, May 17, 1918, *Eames & Wiegand*, no. 10,953; dry gravelly knolls around Malloryville bog, Dryden, May 16, 1919, *Eames;* dry bank along railroad northeast of Freeville, May 16, 1919, *Eames;* upper Cascadilla Creek, May 20, 1919, *Eames;* dry pasture, Caroline, May 18, 1918, *Eames*, no. 10,951; gravelly fields, Caroline, May 20, 1918, *Eames*, nos. 10,946 and 10,950; dry fields, east of North Pinnacle, Caroline, May 8, 1919, *Eames;* field northeast of Fir-tree Swamp, Danby, May 18, 1918, *Eames*, nos. 10,952 and 10,954; Buttermilk Creek, May 13, 1919, *Eames;* pasture, east side of Michigan Hollow Swamp, Danby, May 30, 1919, *Wiegand;* dry fields near Key Hill Swamp, Newfield, May 21, 1919, *Eames & Wiegand* (TYPE in Gray Herb.); sterile hill near Kennedy Pond, Mendon, June 2, 1917, *Eames & Metcalf*, no. 8936.

On account of its narrow leaves and rather dense corymb var. *noveboracensis* is likely to be confused with undeveloped *A. neglecta*, but in that species the upper cauline leaves instead of having firm subulate-aristate tips, bear thin scarious though often involute appendages.

foliis basilaribus anguste obovatis vel spathulato-oblanceolatis supra glabris viridibus lucidis.

Differing from the typical form of the species in having the basal leaves narrowly obovate or spatulate-oblanceolate, glabrous, green and shining above.—Prince Edward Island and Nova Scotia to New York. PRINCE EDWARD ISLAND: open woods, Brackley Point, June 30, 1888, *J. Macoun*, no. 11,285; dry banks and open woods, O'Leary, July 3, 1914, *Fernald & St. John*, no. 11,199; dry sandy soil, Morell, June 29, 1914, *Fernald* & *St. John*, no. 11,198. NOVA SCOTIA: pasture-fields, Yarmouth, May 28, 1910, *J. Macoun*, no. 80,745; moist mixed woods and thickets, Meteghan, July 7, 1920, *Fernald* & *Long*, no. 22,832. MAINE: gravelly bank, Orono, June 4, 1898, *Fernald*, no. 2364 (TYPE in Gray Herb.); slate ledges, Leadbetter Falls, Township iv, Range 18, Somerset Co., July 6, 1917, *St. John* & *Nichols*, no. 2500; dry bank, Perry, July 9, 1909, *Fernald*, no. 2247; dry rocky banks, Cutler, July 4, 1902, *Kennedy, Williams, Collins* & *Fernald;* roadside north of Town Hill, Mt. Desert Island, July 3, 1897, *Rand;* Somesville, July 7, 1897, *Rand;* dry field, Bristol, May 26, 1898, *Chamberlain*, no. 565; North Berwick, May 30, 1899, *Parlin*, no. 1150. VERMONT: roadside, Willoughby, June 9, 1898, *Williams;* Proctor lot, Rutland, June 6, 1899, *Eggleston;* Bald Mt., Shrewsbury, June 6, 1899, *Eggleston*. MASSACHUSETTS: grassy bank, Leicester, May 30, 1912, *Hunnewell* & *Wiegand;* shaded roadside, Southbridge, May 25, 1900, *Harper;* Orange, May 11, 1912, *Fernald, Hunnewell* & *Wiegand;* rocks, Whatley Glen, Whatley, May 17, 1913, *Harger* & *Fernald;* old pasture, Chester, May 17, 1913, *Weatherby* & *Bean;* wet ground, Savoy, May 31, 1901, *Hoffmann;* rocky open bank, Sheffield, May 30, 1919, *Bean* & *Fernald*. RHODE ISLAND: sheltered roadside banks and grassy clearings bordering thickets near Nayatt, Barrington, May 30, 1911, *Fernald*. CONNECTICUT: bank, Burnside, May 3, 1903, *Weatherby*. NEW YORK: along roadside, high on the bluffs of West Canada Creek, East Herkimer, June 4, 1904, *Haberer*, no. 3079; in shade of arbor vitae, border of Hidden Lake, Litchfield, June 15, 1902, *Haberer*, no. 1717; hillside slopes in shade of arbor vitae, border of Cedar Lake, Litchfield, June 15, 1902, *Haberer*, no. 1718; sandy knolls, Deerfield, May 16, 1910, *Haberer*, no. 2014, in part.

On account of the bright green upper surfaces of the basal leaves confused with *A. canadensis* Greene, under which name most specimens have been distributed. Var. *chlorophylla*, however, has the heads of *A. neodioica* and its cauline leaves are clearly of that species. In *A. canadensis* the upper cauline leaves are terminated by an elongate usually twisted thin scarious appendage; in *A. neodioica* and all its varieties the upper cauline leaves are merely subulate-tipped or mucronate. Macoun's no. 11,285 from Prince Edward Island was

cited by Greene as part of his *A. canadensis*, but the remaining specimens cited by him, including the first (from Lake Mistassini) are alike in having the characteristic flag-like appendage of the upper leaves and the longer and paler involucre so typical of *A. canadensis*.

Gnaphalium sylvaticum L. Woodland paths, roadsides and pastured woods, perhaps introduced, Baddeck, Port Bevis and George River. See p. 164.

* *Ambrosia trifida* L. Railroad gravel, Sydney Mines.

* *Rudbeckia laciniata* L. Escaped from cultivation to roadside thicket, Barrington.

** Coreopsis rosea Nutt. Sandy, gravelly or peaty beaches and margins of the Tusket system, Yarmouth Co.: Tusket (Vaughan) Lake; Butler's (Gavelton) Lake and East Branch of Tusket, Gavelton. See p. 160.

Bidens cernua L. We saw no evidence of this generally common species in the western counties of Nova Scotia.

B. connata Muhl., var. petiolata (Nutt.) Farwell; Fernald, Rhodora, x. 200 (1908). Yarmouth Co.: boggy swale, Quinan.

** B. connata Muhl., var. **inundata**, n. var., foliis primariis inferioribus lobatis, lobis 2–4 basilaribus divergentibus decurrentibus, lobo terminali foliisque superioribus lanceolato-attenuatis anguste serratis vel incisis, petiolis gracilibus vix marginatis: achaeniis exterioribus 5.5 mm. longis, interioribus 7–8 mm. longis aristis marginalibus 3–3.5 mm. longis.

Lower primary leaves lobed; the 2–4 basal lobes divergent and decurrent; the terminal lobe and the upper leaves lance-attenuate, slenderly serrate or incised; the petioles slender, scarcely margined: outer achenes 5.5 mm. long; the inner 7–8 mm. long, with marginal awns 3–3.5 mm. long.—Nova Scotia: wettest portion of a springy sphagnous bog, Sand Beach, September 7, 1920, *Fernald, Long* & *Linder*, nos. 22,869, 22,870, October 6, 1920, *Fernald* & *Linder*, no. 22,871 (type in Gray Herb.); sandy brooksides and springy ditches, Baddeck, August 27, 1920, *Fernald* & *Long*, no. 22,866; about pools at bases of gypsum cliffs, Port Bevis, August 27, 1920, *Fernald* & *Long*, no. 22,867.

Closely simulating var. *gracilipes* Fernald, Rhodora, xxi. 103 (1919) of the Cape Cod quagmires but with much larger achenes; var. *gracilipes* having the outer achenes 3–4 mm. long, the inner 4.5–5 mm. long and with awns only 2–2.5 mm. long. See p. 167.

* *Matricaria suaveolens* (Pursh) Buchenau. A common roadside weed wherever we went.

* *Artemisia Stelleriana* Bess. Shelburne Co.: upper border of gravelly strand, Villagedale.

Petasites palmatus (Ait.) Gray. Cumberland Co.: swampy woods and thickets, Springhill Junction. See p. 132.

Senecio sylvaticus L. Thoroughly naturalized, possibly indigenous. One of the characteristic plants of recently burned clearings, borders of woods, or gravelly or rocky shores. Sometimes occurring as a railroad weed but more often found in semi-natural habitats, as on the coast of Maine (see Fernald & Wiegand, RHODORA, xii. 106).

SENECIO PAUPERCULUS Michx., var. **Balsamitae** (Muhl.), n. comb. *S. Balsamitae* Muhl. ex Willd. Sp. Pl. iii. 1998 (1804). *S. aureus*, ε. *Balsamitae* (Muhl.) T. & G. Fl. N. A. ii. 442 (1843), at least as to name-bringing synonym. *S. obovatus*, var. *umbratilis* Greenm. Monogr. Senecio. Teil 1: 24 (1901), in Engl. Bot. Jahrb. xxxii. 20 (1902) and Ann. Mo. Bot. Gard. iii. 115 (1916), at least as to type specimen. *S. gaspensis* Greenm. Ann. Mo. Bot. Gard. iii. 138 (1916).

Typical *Senecio pauperculus*, as shown by Michaux's type specimen and by a photograph of it secured by the writer in 1903, is the northern extreme of the plant with basal leaves 0.3–1 cm. broad; the lower and median cauline very slender, mostly 1–6 mm. wide; the upper very reduced, linear or subulate and mostly entire. This plant is abundant in Labrador and Newfoundland, thence to British Columbia where it passes as *S. flavovirens* Rydb. (such plants as *Lyall*, Lower Frazer River, and *J. M. Macoun*, no. 69,356 from Similkameen River, specimens cited by Greenman as *S. flavovirens*). Greenman distinguishes the two as follows:

"Eastern species.....69. *S. pauperculus.*
Western species.....70. *S. flavovirens*"

but without any morphological characters the two are not satisfactorily separated.

In its typical form *S. pauperculus* occasionally extends southward to northern Maine and northern Michigan, but southward it is chiefly represented by var. *Balsamitae*, in which the basal leaves are larger, mostly 0.8–3 cm. broad; the lower and median cauline larger, the largest 0.6–2.5 cm. broad; and the upper mostly well developed and pinnatifid.

We saw var. *Balsamitae* in Nova Scotia on the faces and talus of gypsum-cliffs at Five-mile River (Hants) and at Port Bevis (Victoria).

* *Arctium nemorosum* Lejeune; Fernald & Wiegand, RHODORA, xii. 45 (1910). Waste ground, Digby and Weymouth.

** *Centaurea nigrescens* Willd. ANNAPOLIS Co.: roadsides and borders of fields, Middleton, growing with the common *C. nigra*.

** *Arnoseris minima* (L.) Dumort. *A. pusilla* Gaertn. YARMOUTH

Co.: gravelly railroad bed near the station, Belleville. See p. 142.

* Lactuca hirsuta Muhl. Yarmouth Co.: dry rocky clearing northwest of Tusket (Vaughan) Lake.

Prenanthes altissima L. Rich woods, Digby Neck to Cape Breton.

P. altissima, forma **hispidula** (Fernald), n. comb. Var. *hispidula* Fernald in Brainerd, Jones & Eggletson, Fl. Vt. 89 (1900). Digby Co.: rich moist woods, Sandy Cove.

Hieracium Pilosella L. Too common along the line of the Canadian National eastward.

* *H. pratense* Tausch. Fields and railroad banks, Annapolis and Digby Cos.

H. paniculatum L. Yarmouth Co.: border of mixed woods by Randel Lake, Argyle.

Explanation of Plate 130.

Fig. 1. Northeastern Range of *Carex Howei*. 2. Southeastern Range of *Empetrum nigrum*. 3. Range of *Ilex glabra*. 4. Northern Range of *Utricularia subulata*. 5. Range of *Poa costata*. 6. Northeastern Range of *Cystopteris bulbifera*. 7. Range of *Erigeron hyssopifolius*. 8. Range of *Amelanchier canadensis*. 9. Portion of Range of *Carex scabrata*. 10. Eastern Range of *Lilium canadense*. 11. Range of *Schizaea pusilla*. 12. Ranges of *Sabatia decandra* (solid) and *S. Kennedyana* (in ellipse). 13. Northeastern Range of *Polygonum robustius*. 14. Range of *Eleocharis tuberculosa*. 15. Northeastern Range of *Potamogeton pulcher*. 16. Northeastern Range of *Panicum longifolium* (Var. *Tusketense* in ellipse). 17. Range of Genus *Lophiola*.

RANGES OF NOVA SCOTIAN PLANTS

64

CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY

New Series. — No. LXIV.

I. Records preliminary to a general treatment of the *Eupatorieae*,—I.
II. The Mikanias of northern and western South America.

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Published by
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1922

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I. RECORDS PRELIMINARY TO A GENERAL TREATMENT OF THE EUPATORIEAE,—I.

In further study of the Eupatorium Tribe of the *Compositae*, during the past year, the following plants have been encountered which appear to merit characterization as novelties or to require further elaboration or readjustment in their classification.

Ageratum (§ **Euageratum**) **Arsenei**, spec. nov., debile carnosulum parce griseo-villosum decumbens basin versus distincte repens fere a basi ramosum 2–3 dm. altum; ramis adscendentibus foliosis; caulibus subteretibus striato-costulatis pallide flavido-viridibus; internodiis plerisque 1–4 cm. longis saepe leviter curvatis vel flexuosis; foliis oppositis vel superne alternis suborbiculari-ovatis apice rotundatis lateraliter crenato-serratis (dentibus utroque saepius 3–6) basi rotundatis vel subcordatis utrinque laxe villosis parvis 7–15 mm. longis 6–12 mm. latis; petiolo 3–7 mm. longo villoso; corymbis ramos terminantibus subdensis 3–16-capitulatis; capitulis ca. 6 mm. altis et 7 mm. diametro breviter pedicellatis ca. 36-floris; involucri squamis ca. 18 lanceolatis attenuatis herbaceis parce pilosis plerisque 2-costulatis; corollis coeruleo-purpŭreis hispidulis; tubo proprio ca. 1.5 mm. longo; faucibus cylindricis 1 mm. longis; dentibus limbi vix 0.5 mm. longis; achaeniis 1.7 mm. longis hispidulis, aliis solum cum squamis 5 brevibus ca. 0.7 mm. longis irregulariter erosis coronatis, aliis cum 1 vel 2 squamis ca. 2.2 mm. longis munitis.—Mexico: Cercado near Monterey, *Bro. Arsène*, 12/11 1911 (K., phot. and slight fragm. Gr.).

This plant, obviously related to *A. conyzoides* L., differs from it by its strongly decumbent somewhat repent habit and probably perennial nature. Its leaves are much smaller and less numerously toothed, and the pappus is notably different. About two thirds of the achenes are crowned by five short erose acutish scales (about 0.7 mm. in length), while in the pappus of the remaining achenes of the same head one or two of the five scales are developed to much greater size, nearly equalling the corolla in length. A somewhat similar condition obtains in the South American and West Indian *A. conyzoides*, var. *inaequipaleaceum* Hieron., but that variety has the suberect clearly annual habit and larger leaves of the typical form. Furthermore, the longer pappus-scales there terminate in a slender bristle-like elongated awn, while here they are scale-like nearly to the gradually attenuate summit.

Stevia micradenia, nom. nov., *S. laxa* Robinson & Seaton, Proc. Am. Acad. xxviii. 107 (1893), not Hook. & Arn.

TRICHOGONIA RHADINOCARPA Robinson, Proc. Am. Acad. xlii. 36 (1906). As the original material of this plant exhibited a slight lignescence toward the base of the stem, it was described as "suffrutescens." Neither the type specimen nor toward a dozen other sheets of this species subsequently examined during the last fifteen years have shown the root. However, the writer is now in receipt of more complete material recently collected near Caracas, Venezuela, 15 Dec. 1920, by L. H. & E. Z. Bailey (no. 54), which, although possessing a somewhat woody stem, has a characteristically annual root.

EUPATORIUM ORGYALOIDES Robinson, Proc. Am. Acad. lv. 24, 60 (1919). This species was described from a specimen of Spruce's no. 4546, received from Kew for study, but accompanied by no detailed data of collection. A subsequent loan from the same source contains an isotype (specimen of the same number as the type) with label bearing the following information: "Frutex 5ped debilis ramosus aromaticus. Flores pallide lilacini. Tarapoto, locis scopulosis ad rivulos. Maio/56."

EUPATORIUM PARASITICUM Klatt, Ann. Naturhist. Hofmus., Vienna, ix. 357 (1894). Among some undertermined plants recently lent from the Royal Gardens at Kew for study by the writer there was found a specimen of Endrès's no. 147 from Costa Rica, that is to say an "isotype" of Klatt's *Eupatorium parasiticum*, founded upon a specimen in the Natural History Museum at Vienna. In Klatt's own herbarium, some years ago acquired by the Gray Herbarium, the representation of this species is confined to a single leaf and some minute fragments of inflorescence. With these the more ample Kew material corresponds so precisely as to leave no doubt of its identity. Klatt's description is brief and does not appear in all points applicable to the Kew material, which for instance has terete (though longitudinally rugulose) stems and decidedly narrower involucral scales scarcely 1 mm. in width. The Kew material is labelled *Mikania* (in hand of J. G. Baker) and certainly suggests some species of that genus. However, several of the heads have clearly five florets and the involucre appears to consist of about 5 subequal inner scales with 1–3 considerably shorter and unequal outer ones. These features, as well as the absence of any tendency to twine, certainly make it best to refer the plant to *Eupatorium* rather than *Mikania*. Furthermore from its habit and many of its technical features it is clearly related to the Colombian *E. sciaphilum* Robinson. The latter, however, has thicker quite entire leaves with an oblanceolate- or obovate-spatulate

tendency, stouter branches and pedicels, and about 10-flowered heads. In view of the rarity of *E. parasiticum*, which seems never to have been rediscovered and in consideration of its alleged parasitic nature,—a habit which, if duly verified, would make it quite exceptional among the *Compositae*,—the species seems to have sufficient interest to warrant the following redescription in somewhat greater detail than was accorded it in Klatt's brief diagnosis.

E. PARASITICUM Klatt (character drawn from an isotype at Kew). Branches terete, grayish-brown, longitudinally rugulose, but not (as described by Klatt) angled; internodes 7–40 mm. long; leaves lance-oblong, narrowed to an obtusish or slightly rounded tip, remotely and rather obscurely 2-4-toothed on each side, cuneate at base, glabrous, coriaceous but not very fleshy, 3.4–5 cm. long, 1.3–2.4 cm. wide; midrib narrow and depressed on the upper surface, scarcely prominent beneath, the lateral veins or nerves barely perceptible, leaving the midrib somewhat above the base; petioles about 3 mm. long; compound corymbs convex, their slender branches and filiform pedicels (4–7 mm. in length) finely puberulent; the minute hairs purplish-brown, incurved, fugacious except for their somewhat hardened bases which persist and give the lower part of the inflorescence a slightly granulated appearance under a lens; involucral scales lance-linear or narrowly oblong, obtuse, dorsally granular, the longer about 4.3 mm. in length, but scarcely 1 mm. wide (instead of 2 mm. wide as stated by Klatt); corolla lilac-purple, deeper toward the limb, 5 mm. long, gradually enlarged almost from the base to the limb; teeth deltoid-ovate, scarcely 0.4 mm. long; achenes 2.8 mm. long, slightly tapering downward, somewhat roughened with prominulent glands, 6–8-ribbed, that is to say with 1–3 less prominent (secondary) ribs scattered among the 5 primary ones as in *E. intercostulatum* Robinson (see Proc. Am. Acad. liv. 314) and *Brickellia Fendleri* Gray (see Mem. Gray Herb. i. 12, 114); pappus-bristles about 50, delicately capillary, not thickened toward the summit.

Mikania acutissima Rusby in herb., volubilis elata subherbacea vel molliter lignescens; caulibus teretibus brunnescentibus post exsiccationem multicostulatis fistulosis 8 mm. vel ultra diametro nodos versus patenter hispidis; foliis caulinis late ovatis integerrimis cuspidato-acuminatis basi sinu angusto profunde cordatis ca. 21 cm. longis 14–18 cm. latis membranaceis supra laete viridibus obscure praesertim nervos versus pulverulenti-puberulis subtus paullo pallidioribus in nervis parce pubentibus a basi 7(–9)-nervatis distincte reticulatis sed venis immersis; petiolo 6–7.5 cm. longo patenter hispido;

foliis rameis et floralibus multo minoribus ellipticis basi rotundatis vel subcordatis; inflorescentia terminali thyrsoidea 1–1.8 dm. longa 7–10 cm. crassa densiuscula; capitulis ca. 1 cm. longis gracilibus sessilibus in glomerulos hemisphaericos vel subglobosos dispositis; bracteolis lanceolatis acutis ca. 3.5 mm. longis; involucri squamis lineari-oblongis obtusis 7 mm. longis 1.25 mm. latis 1–2-nervatis basi subcallosis apicem versus hispidulis; corollis albis glabris ca. 6 mm. longis; tubo proprio gracili 3 mm. longo; faucibus turbinato-subcampanulatis 2 mm. altis; dentibus limbi ovatis ca. 1.2 mm. longis apice recurvato-submucronatis; achaeniis gracilibus brunneis glabris ca. 3 mm. longis; pappi setis ca. 37 subcarneis sursum paullo incrassatis.—COLOMBIA: Dept. Magdalena: thicket on a ridge, Horqueta Mountain, alt. 2288 m., *H. H. Smith*, no. 2613 (TYPE N. Y., phot. and fragm. Gr.); Las Nubes, alt. 1373 m., *H. H. Smith*, no. 632 (N. Y.).

This species is transitional between §§ *Globosae* and *Thyrsigerae*. In habit it is closely similar to a plant collected on the island of St. Vincents among the Lesser Antilles by H. H. & G. W. Smith (no. 1890), which however, differs in having slightly smaller heads somewhat spicately disposed on the short axis of the glomerule, also in having the stem essentially smooth and not hispid about the nodes.

The plant of St. Vincents has been referred by Urban, Symb. Ant. v. 220 (1907), to *M. Badieri* DC., but seems in all probability distinct, the real *M. Badieri* having even the mature cauline leaves elliptic, decidedly fleshy, and not at all cordate. The Colombian plant here described is clearly distinct from both. Dr. Rusby's specific name alludes, of course, to the conspicuous and in the type-sheet very sharp acumination of the leaves.

M. (§ **Thyrsigerae**) **Aristei**, spec. nov., verisimiliter saltim aliquanto lignescens et scandens; caule tereti, 5 mm. vel ultra diametro medulloso dense patenterque brunneo-tomentello; medulla alba; foliis oppositis late elliptico-ovatis obtusis cuspidatis basi rotundatis vel obtusis margine cuspidato-dentatis utrinque viridibus breviter praesertim in costa et veniis subferrugineo-hirsutis 6–7 cm. longis 3.5–5.5 cm. latis penniveniis; venis lateralibus majoribus 2-jugis; dentibus ca. 1 mm. altis 2–7 mm. inter se distantibus; petiolo subtereti dense ferrugineo-tomentoso 1.6–2 cm. longo; thyrso ovali ca. 1.5 dm. longo ca. 1 dm. crasso usque ad mediam partem foliaceo-bracteato ferrugineo- vel subpurpureo-tomentello; capitulis sessilibus prope apices ramulorum glomeratis; involucri ca. 8.5 mm. longi squamis linearibus obtusis basi convexis ca. 1.5 mm. latis dorso tomentellis, pilis patentibus; corollis ut videtur flavescenti-albidis ca. 5.5 mm.

longis; tubo proprio 1.5 mm. longo glabro; faucibus distincte ampliatis subcylindricis 4 mm. longis 2.5 mm. diametro sparse villosulis; dentibus limbi 1 mm. longis deltoideis dorso villosulis; achaeniis valde immaturis paullo puberulis ca. 4.3 mm. longis; pappi setis ca. 40 flavescenti-albidis apice paullulo incrassatis.—COLOMBIA: Páramo de Guasca, 22 Dec. 1919, *Bro. Ariste-Joseph*, no. A480 (Gr.).

This species with coarsely pubescent unlobed leaves, sessile heads, and the corolla-throat nearly twice as long as thick, obviously keys out near *M. rufa* Benth., which, however, has broadly ovate acuminate and deeply cordate leaves, smaller heads in a much more densely congested inflorescence, and other differences.

M. (§ **Thyrsigerae**) **Buchtienii**, spec. nov., ut videtur herbacea (basi ignota) volubilis; caule primo hexagono crispe fulvo-tomentello maturitate subtereti fistuloso ca. 4 mm. vel ultra crasso; internodiis saepe 2 dm. vel ultra longitudine; foliis deltoideo-hastatis acuminatis undulato-denticulatis vel integriusculis basi subtruncatis vel patenter cordatis 5–6.5 cm. longis 3.7–4.5 cm. latis submembranaceis a basi 3(–5)-nerviis supra viridibus in nervis ferrugineo-tomentellis subtus molliter griseo-tomentellis; petiolo 2–3 cm. longo gracili fulvo-tomentello, pilis crispis; paniculis terminalibus et lateralibus 1.5–2.5 dm. longis 1–1.6 dm. crassis foliaceo-bracteatis sublaxis fulvo-tomentellis; pedicellis 2–5 mm. longis in summo bracteolatis; bracteolis lanceolatis acutis 2.5–3 mm. longis; involucri squamis brunneis 4.5 mm. longis 0.8–1.6 mm. latis ciliolatis; corollis glabris gracilibus ca. 5 mm. longis; tubo proprio 3.5 mm. longo curvato; faucibus vix ullis; dentibus limbi lanceolatis acutis patentibus ca. 1.5 mm. longis; achaeniis 2.8 mm. longis fusco-griseis glabris cum angulis pallidioribus; pappi setis ca. 40 subcarneis ca. 5 mm. longis vix scabratis.—BOLIVIA: Polo-Polo near Coroico in Prov. Nor Yungas, alt. 1100 m., *Dr. Otto Buchtien*, nos. 3935 (TYPE, N. Y., phot. and fragm. Gr.) and 3936 (N. Y., phot. Gr.).

M. (§ **Globosae**) **desmocephala**, spec. nov., volubilis; caule subtereti post exsiccationem sulcato-pluricostulato atropurpureo minute granulato lignescente fistuloso; foliis ovato-oblongis caudato-acuminatis integris anguste ad marginem revolutis utrinque glabris subtus pallidioribus fere a basi pinnatim 5-nervatis basi rotundatis 10–15 cm. longis 5–7.5 cm. latis; petiolo 2–4.5 cm. longo; panicula terminali magna composita pyramidali; capitulis ca. 8 mm. longis arcte sessilibus in glomerulos subglobosos (ca. 2 cm. diametro) aggregatis; bracteolis ovatis obtusis ca. 2 mm. longis griseo-puberulis; involucri squamis oblongis viridi- vel brunneo-stramineis apice rotundatis dorso pulverulenti-puberulis tenuiter striatulis; corollis

4–5 mm. longis; tubo proprio gracili 2 mm. longo; faucibus anguste campanulatis 1.2 mm. altis; limbi dentibus lanceolato-oblongis 1.2 mm. longis obscure dorso granulatis; achaeniis atrobrunneis ca. 3.3 mm. longis in faciebus paullulo granulatis, angulis pallidioribus; pappi setis ca. 25, leviusculis sursum non incrassatis aetate carneo-subfulvis.—*M. angularis* Britton, Bull. Torr. Bot. Club, xix. 1 (1892), not H. & B.—BOLIVIA: "near Yungas" [i. e. within or near the boundaries of the province so called], alt. 1220 m., *Rusby*, no. 1740 (N. Y., phot. and fragm. Gr.).

M. (§ **Corymbosae**) **dictyophylla,** spec. nov., fruticosa robusta volubilis; caule tereti 5 mm. vel ultra diametro fistuloso post exsiccationem obscure striatulo tomentello scabriusculo; indumento brevi patente denso recto hinc pallido hinc atropurpureo; internodiis usque ad 1 dm. longis; foliis ovatis subacuminatis undulato-denticulatis basi rotundatis vel vix in petiolum subdecurrentibus crassiusculis firmiusculis penniveniis supra argute scabris subtus tomentellis et conspicuiter reticulatis 1–2 dm. longis 6–14 cm. latis; venis lateralibus ca. 3-jugis ab costa infra mediam partem orientibus; venis venulisque prominentibus; petiolis 1.5–3(–4) cm. longis basi a linea tumida transverse conjunctis; corymbis compositis valde convexis pedunculatis saepissime in axillis supremis alternis; foliis supremis ovato-rhombeis utroque acutis; bracteis lanceolato-linearibus; capitulis ca. 1 cm. longis sessilibus ternis; involucri squamis rigidulis oblongis dorso convexis praecipue apicem rotundatum versus brunneo-tomentellis et cum glandulis sessilibus conspersis; corollis pallide flavidis extus glandulosis; tubo proprio 3 mm. longo gradatim in fauces ca. 3 mm. longas turbinato-subcylindricas dilatato; dentibus limbi vix 0.7–0.9 mm. longis; achaeniis 3.5–4 mm. longis griseis in faciebus leviter granulatis; pappi setis ca. 65 albidis.—COLOMBIA: shrubby vine with cream-yellow flowers, in forest, alt. 1300–1800 m., Dept. Huila, on Cordillera Oriental east of Neiva, *Rusby & Pennell*, no. 1004 (N. Y., phot. and fragm. Gr.).

This species differs from *M. guaco* HBK. in its much thicker prominently reticulated leaves with blade more rounded at the base and scarcely at all decurrent upon the relatively much shorter petiole. From *M. latifolia* J. E. Sm. and *M. parviflora* (Aubl.) Karst it differs in its far greater pubescence and much shorter corolla-teeth. The Peruvian *M. speciosa* DC. must be of somewhat similar habit, but is described as having petioles 2 inches in length, that is, fully one-third as long as the blade, while here they are both actually and relatively shorter. If, as seems probable, *M. speciosa* is represented by Cook

& Gilbert's no. 947, it has corolla-teeth of much greater length than those of the Colombian plant here described.

M. (§ **Thyrsigerae**) **eucosma**, spec. nov., gracilis glaberrima paullo lignescens; caule tereti a cortice griseo-brunneo obtecto; ramis adscendentibus teretibus post exsiccationem sulcato-costulatis purpureo-brunneis; internodiis usque ad 1 dm. longis; foliis elliptico-ovatis ad apicem subcuspidatum obtusum acuminatis integris basi paullo acutatis 7–9 cm. longis 3.5–4.5 cm. latis coriaceis a basi 5(–7)-nervatis utrinque glaberrimis sublucidis pulcherrime reticulatis; petiolo gracili flexuoso purpureo glabro ca. 2 cm. longo; paniculis terminalibus 3 dm. longis 1–1.5 dm. diametro foliaceo-bracteatis; bracteolis ovato-lanceolatis ciliolatis ca. 1.5 mm. longis; capitulis ca. 5–6 mm. longis breviter pedicellatis; involucri squamis oblongis obtusis brunnescenti-substramineis 3.5 mm. longis basi aliquid angustatis calloso-incrassatis et paullo connatis apicem versus obscure puberulis; corollis ca. 3.5 mm. longis glabris; tubo proprio ca. 1 mm. longo; faucibus distincte ampliatis subcylindricis ca. 2 mm. longis; limbi dentibus ca. 0.6 mm. longis; achaeniis pallidis 2.7 mm. longis paullo inter costas puberulis; pappi setis ca. 50 capillaribus albidis sursum hispidulis apicem versus non incrassatis.—*M. Lindbergii* Britton, Bull. Torr. Bot. Club, xix. 1 (1892), not Bak.—BOLIVIA: Yungas, alt. 1830 m., *Rusby*, no. 1736 (N. Y., phot. and fragm. Gr.).

This Bolivian plant, while closely related to the Atlantic Brazilian *M. Lindbergii*, differs in many particulars. In the latter the leaves are somewhat more oblong-lanceolate, shorter-petioled, pinnately nerved, and decidedly lucid. On their upper surface the veins and veinlets are slightly depressed instead of being, as in *M. eucosma*, beautifully raised in a fine reticulation. *M. eucosma* may be readily distinguished by its prominent veinlets from the nearly related *M. trinervis* Hook. & Arn. From *M. laevigata* Sch.-Bip. (known to the writer only from character) it appears to be adequately separated by having conspicuously 5-nerved ovate-oblong leaves half as wide as long, instead of their being as in the Brazilian plant 3-nerved, oblong-lanceolate, and only about one-third as wide as long.

M. (§ **Corymbosae**) **flaccida**, spec. nov., gracilis volubilis invalida flaccida quasi aliquanto hydrophytica in caule (praecipue nodos versus) et in inflorescentia et in facie inferiore foliorum obscure strigillosa aliter glabra; caulibus subteretibus sulcato-costulatis ca. 3 mm. diametro herbaceis; internodiis 8–12 cm. longis; ramis flagelliformibus flexuosis perelongatis vix 1 mm. crassis; foliis caulinis lanceolatis caudato-acuminatis undulatis vel integris basi rotundatis

6–8 cm. longis 1.7–2.6 cm. latis tenuiter membranaceis subtranslucentibus utrinque viridibus fere a basi 3(–7)-nervatis; petiolo gracili ca. 17 mm. longo; foliis rameis lanceolatis multo minoribus 1–2 cm. longis 2–7 mm. latis; inflorescentiis axillaribus trichotomis foliaceo-bracteatis 6–8 cm. diametro; pedunculis ca. 7 cm. longis compressis; bracteis lanceolatis 1–1.5 cm. longis; bracteolis similibus saepe capitula superantibus; pedicellis angulatis 1–2 mm. longis; capitulis ca. 8.5 mm. longis; involucri squamis oblongis acutis tenuibus viridibus striatulis 8 mm. longis 1.7 mm. latis; corollis (immaturis) 4 mm. longis glabris; tubo proprio 1.5 mm. longo; faucibus vix 1 mm. longis; dentibus limbi lanceolato-oblongis 1.5 mm. longis; achaeniis (valde immaturis) glabris ca. 4 mm. longis; pappi setis ca. 32 sordido-carneis.—BOLIVIA: Polo-Polo near Coroico, Prov. Nor Yungas, alt. 1100 m., Oct. and Nov. 1912, *Dr. Otto Buchtien*, no. 3951 (N. Y., phot. Gr.).

M. GRACILIPES Robinson, Contrib. Gray Herb. n. ser. lxi. 15 (1920). This species from northern Venezuela was founded upon the material of Fendler's no. 2348 in the Gray Herbarium. Subsequently examined material of the same number from the Missouri Botanical Garden, while corresponding in essentials so closely as to be surely conspecific, shows some unsuspected variation. Thus its cauline leaves are of larger size, being as much as 13 cm. long and 9 cm. wide, and have on one or both sides a bluntish angle or spreading short lobe. In texture and other respects they are closely like the specimen of 2348 in the Gray Herbarium and their differences may be attributed to mere individual variation.

M. GUACO H. & B. Pl. Aeq. ii. 84, t. 105 (1809). This species is not included in Grisebach's Flora of the British West Indies, nor in Urban's detailed treatment of the West Indian Mikanias (Symb., 212–233), and its occurrence does not appear to have been established on any of these islands. It is true, Descourtilz, Fl. Ant. ed. 2, iii 211, t. 197 (1833), mentions *M. guaco* as naturalized and frequently met with in the Antilles. His statements, however, were so vague and his plate so unconvincing that subsequent writers have hesitated to accept his authority on a point so technical, for there are in the West Indies several Mikanias bearing locally the same vernacular name "guaco" and of such similar habit that they would have been readily classed with it by a writer of Descourtilz's period, particularly if his interest in it was medical rather than botanical. It seems therefore worthy of record that a specimen recently examined from Trinidad appears certainly to be the true South American *M. guaco* H. & B., agreeing in all essentials with material from Colombia, the Guianas,

etc. This plant was kindly lent at the suggestion of Dr. N. L. Britton by the Director of the Trinidad Botanic Gardens. The label bears the number 2019 and reads "*Mikania latifolia* Sm. Road to Bonaventure. 5 January 1866." Unfortunately the collector is not mentioned. While the plant is in the blackened and crumbling condition of material long stored in the tropics it still shows all characters needful for its identification, particularly the relatively short corolla-teeth and cuneate decurrence of the leaf on the petiole which distinguish it from *M. latifolia*, and the sessile ternate heads, which keep it out of *M. rotunda* Griseb.

M. (§ **Thyrsigerae**) **Holwayana**, spec. nov., verisimiliter alte scandens et fortasse aliquanto molliter lignescens; caulibus subteretibus fistulosis (post exsiccationem) sulcato-striatis dense tenuiterque puberulis denique glabratis, pilis brevissimis patentibus monili-formibus fulvo-purpureis; internodiis 4–10 cm. longis vel ultra; foliis late ovatis acuminatis obscure cuspidato-denticulatis vel -undulatis lato sinu rotundato cordatis sed ad insertionem petioli saepius breviter acuminatis tenuiter membranaceis supra viridibus puberulis (praecipue in nervis) ima a basi vel paullo supra basin 3–5- nerviis subtus albescente tomentellis juventate plus minusve purpureo-tinctis 7–16 cm. longis 5–14 cm. latis; nervis et venis principibus purpureo-brunneis; petiolo usque ad 3 cm. longo obscure puberulo fusco-brunneo; foliis supremis vix cordatis vel subtruncatis vel etiam basi rotundatis; paniculis terminalibus et lateralibus magnis 4–5 dm. altis 2.5–3 dm. diametro pyramidalibus oppositirameis laxiusculis; partialibus pedunculatis ca. 1 dm. longis et crassis; pedicellis 1.5–3 mm. longis; bracteola saepius in summo pedicelli subherbacea lanceolato-lineari acuta 4 mm. longa; capitulis 1 cm. longis; involucri squamis obovato-oblongis apice rotundatis tenuibus breviter ciliolatis 6.5 mm. longis 2 mm. latis; corollis albis glabris ca. 6 mm. longis, tubo proprio cylindrico ca. 3.5 mm. longo, faucibus brevissimis; dentibus limbis ovatis acutiusculis ca. 2.2 mm. longis patentibus; achaeniis (immaturis) glabris 3.5 mm. longis; pappi setis ca. 50 albis tenuibus apice non incrassatis.—ECUADOR: Huigra, Prov. Chimborazo, Aug. 5, 1920, *Prof. & Mrs. E. W. D. Holway* (Gr., N. Y., U. S.).

It is a pleasure to dedicate this beautiful and well marked species to its discoverers, Professor and Mrs. Holway of the University of Minnesota, who have travelled widely in the American tropics in search of parasitic fungi, but who incidentally have done much to further the knowledge of the flowering plants.

M. (§ **Thyrsigerae**) **incasina**, spec. nov., verisimiliter volubilis plus

minusve lignescens; ramis subteretibus brunneis juventate crispe puberulis mox glabratis post exsiccationem pluricostulatis; foliis anguste deltoideo-ovatis subintegris a basi subtruncata ad apicem acuminatum gradatim angustatis 5–7 cm. longis 2.5–3.7 cm. latis in latere utroque paullo uniangulatis fere a basi 5(–7)-nervatis membranaceis supra viridibus sparse pubentibus subtus griseo-tomentellis; petiolis gracilibus 1.5–2 cm. longis, eis ejusdem jugi basi anno prominente transverso tomentello conjunctis; paniculis terminalibus conicis oppositirameis modice laxis foliaceo-bracteatis ca. 2 dm. vel ultra longis et 1 dm. crassis crispe puberulis; pedicellis 0.5–2 mm. longis; capitulis ca. 9.5 mm. longis; bracteola in summo pedicelli lineari puberula ca. 3.2 mm. longa; involucri squamis oblongis obtusis ca. 5 mm. longis et 2 mm. latis substramineis dorso paullo puberulis obscure striatulis; corollis ca. 5.8 mm. longis glabris ut videtur albis; tubo proprio 2.4 mm. longo; faucibus vix ullis 0.8 mm longis; dentibus lanceolatis 1.8 mm. longis 1 mm. latis; achaeniis immaturis 3.2 mm. longis; pappi setis ca. 50 flavescenti-albidis barbellatis apicem versus paullulo incrassatis.—PERU: Chachapoyas, *Mathews* (K., phot. and fragm. Gr.).

M. (§ **Corymbosae**) **jamaicensis**, spec. nov., fruticosa ut videtur volubilis; caulibus (ramisve) teretibus lignescentibus juventate dense breviterque fulvo-tomentosis maturitate glabriusculis a cortice brunnescente griseo obtectis post exsiccationem longitudinaliter striato-rugulosis; foliis (supremis tantum visis) ovatis integris basi subtruncatis crassiusculis 3–4.2 cm. longis 2.4–3.4 cm. latis supra sordide tomentellis subtus pallidioribus crebre reticulatis breviter denseque fulvido-tomentosis fere a basi triplinerviis; petiolo fulvo-tomentoso 1.5 cm. longo; corymbis in ramis brevibus gestis 5–9 cm. diametro valde convexis densiusculis fulvo-tomentosis; bracteis ovatis petiolatis; bracteolis anguste lanceolato-oblongis vel linearibus; pedicellis 1–5.5 mm. longis; capitulis ca. 13 mm. longis; involucri squamis obtusis ca. 9 mm. longis rigidiusculis, exterioribus oblongis 2.7 mm. latis dorso dense fulvo-tomentosis, interioribus (costa media tomentosa excepta) glabriusculis obovatis 3 mm. latis; corollae tubo proprio 2 mm. longo paullo glanduloso; faucibus anguste campanulatis ca. 2 mm. longis; dentibus limbi lanceolato-oblongis obtusiusculis; achaeniis gracilibus 5 mm. longis glandulari-granulosis; pappi setis ca. 67 capillaribus aetate sordide carneis apicem versus non incrassatis vix scabridis.—TYPE, a specimen belonging to the herbarium of the Royal Gardens at Kew and bearing the memoranda: "J. P. 984" and "From the Jamaica Botanical Department, May,

1898." Also a further note signed by R. A. Rolfe which reads: "J. P. 984 and 1020 represent a species of *Mikania*, but I do not match it with anything in the genus at Kew. It may be undescribed. I suppose it is indigenous." To this is added in pencil "Certainly D. M."

From Mr. A. B. Rendle of the British Museum, it has been learned that "J. P." stands for Jamaica Plants and "D. M." for Sir Daniel Morris, formerly director of the Jamaica Botanic Garden, under whose supervision extensive collections were made. There is at the British Museum a partial list of these plants and this, as Mr. Rendle informs me, indicates that "J. P. 984" was collected at "Claverly Cottage," a place on the north side of the Blue Mountains, while for "J. P. 1020" no locality is assigned.

If placed by the key to the West Indian species of *Mikania* given by Urban, Symb. v. 212 (1907) this species would appear to fall near *M. rotunda* Griseb. from which, however, it differs in its larger heads, relatively longer corolla-teeth, tomentose leaves, etc.

M. (§ **Corymbosae**) **Joergensenii**, spec. nov., volubilis; caule hexagono inter angulis striato-costulato ut videtur herbaceo juventate puberulo mox glabrescente 2–3 mm. crasso; internodiis 1.5–2 dm. longis flexuosis; foliis elongato-ovatis attenuatis 9–11 cm. longis 4–6 cm. latis membranaceis utrinque viridibus puberulo-scabridulis subtus paullo pallidioribus fere circum totam marginem conspicuiter argute dentatis ima a basi 5(–7)-nervatis sinu profundo inter lobos rotundatos cordatis; dentibus utroque latere ca. 40–50 divaricatim patentibus 3–5 mm. inter se distantibus saepe altioribus quam latis acutiusculis apice obscure callosis; pseudo-stipulis foliaceis conspicuis fere ad basin partitis; segmentis lanceolatis 10–12 mm. longis; corymbis (immaturis) glomeruliformibus ramos ramulosque terminantibus 2–3.5 cm. diametro; capitulis ca. 9 mm. longis; involucri squamis oblanceolato-oblongis 7–8 mm. longis acutis, exterioribus subherbaceis dorso crispe puberulis ca. 1.8 mm. latis, interioribus 2.4 mm. latis media parte herbacea puberula excepta subglabris substramineis aliquid diaphanis; corolla ca. 6 mm. longa (statu juvenile) glabra; tubo proprio 2.5 mm. longo; faucibus subcylindricis ca. 2.5 mm. longis; dentibus limbi lanceolato-ovatis subacutis 1.2 mm. longis; nectario ad styli basin cylindrico alto fuscescente; achaeniis glabris (valde immaturis) 2 mm. longis deorsum decrescentibus; pappi setis ca. 75 flavescenti-albidis vix scabratis sursum non incrassatis.—ARGENTINA: Dept. Andalgalá: Prov.Catamarca: Común Andalgalá, 6 Nov. 1915, *Pedro Jörgensen*, no. 1088 (TYPE, in herbarium of Missouri Botanical Garden, phot. Gr.).

This plant, labelled "*Loconte blanca*" and distributed as *M. scandens*, is striking by reason of the unusual nature of the leaf-toothing, which begins almost at the insertion of the petiole and runs nearly to the slender acuminate apex, the teeth being sharp, rather narrower than long, and radially divergent, thus giving the plant an unusual appearance in a group where the leaves are prevailingly crenate-serrate or -dentate. It is a pleasure to name this interesting plant for the discoverer who by his extensive collecting in various parts of the Argentine Republic has done much to increase the knowledge both of the plants and insects of that country.

M. (§ **Corymbosae**) **Johnstonii**, spec. nov., fruticosa volubilis; ramulis hexagonis puberulis; caulibus teretibus brunneis glabris lucidis fistulosis; internodiis usque ad 2.6 dm. longis; foliis ovato-suborbicularibus breviter acutatis vel aliquando argute acuminatis subintegris margine revolutis basi rotundatis vel paullo acutatis 5–11 cm. vel ultra longis 3.5–7 cm. latis subcoriaceis a puncto valde supra basin triplinerviis supra glabris lucidulis plus minusve bullatis subtus dense brevissimeque olivaceo-tomentellis; petiolis 2–4 cm. longis, eis ejusdem jugi a linea prominulente circum nodum tumidum conjunctis; corymbis laxiusculis trichotomis; pedicellis 2–5 mm. longis apice bracteolatis; bracteolis oblanceolatis subpetiolatis; capitulis 1 cm. longis; involucri squamis anguste oblongis obtusiusculis dorso tomentellis ca. 8 mm. longis; corollis ca. 6.5 mm. longis glabris; tubo proprio gracili cylindrico 2 mm. longo; faucibus brevibus vix 1 mm. aequantibus abrupte dilatatis; dentibus limbi lanceolatis acutis 3.5 mm. longis; achaeniis gracilibus deorsum attenuatis griseo-brunneis paullo glandulosis 5 mm. longis; pappi setis ca. 65 albidis vel pallide carneis.—*M. amara* J. R. Johnston, Proc. Bost. Soc. Nat. Hist. xxxiv. 267 (1909), not Willd.—VENEZUELA: Margarita Island, en route from El Valle to Juan Griego, 12–15 Aug. 1903, *J. R. Johnston*, no. 104 (Gr.).

Persistent effort has thus far failed to place this plant satisfactorily in any hitherto described species. From *M. parviflora* (Aubl.) Karst. and *M. latifolia* J. E. Sm. of somewhat similar foliage and habit it differs manifestly in its pedicelled heads, somewhat longer petioles, and tomentellous under surface of the leaves; from *M. oopetala* Urb. by its pedicelled heads, lanceolate corolla-teeth, and relatively shorter corolla-tube; and from *M. rotunda* Griseb by its hexagonal branches, the pubescence of its leaves, and its longer corolla teeth. It is a pleasure to dedicate this species to its discoverer, Mr. John Robert Johnston, who diligently explored Margarita Island and published an admirable flora of it.

M. LEIOSTACHYA Benth. Pl. Hartw. 201 (1845). This species was in its original diagnosis misleadingly described as "undique glaberrima." Some years ago in reply to an inquiry addressed to the Kew Herbarium Dr. Otto Stapf informed the writer that the type-specimens of this species were not in reality so smooth as implied by the expression in question, but were rather to be described as "parce puberula vel subglabra." As a much more pubescent form has now been found the following distinction may be recorded:

Forma α. **typica**, parce puberula vel subglabra.—COLOMBIA, PANAMA, GUATEMALA, and BRITISH HONDURAS.

Forma β. **irrasa**, forma nova, f. typicae omnibus simillima sed differt pubescentia multo copiosiore; caulibus et petiolis et praesertim axe ramisque inflorescentiae fulvido-tomentosis.—ECUADOR: Cusatagua, vicinity of Ambato, Prov. Tungurahua, *A. Pachano*, no. 201 (U. S.). While seemingly but a form of *M. leiostachya* this may perhaps have been the plant described by the late Prof. Hieronymus as his *M. Sodiroi* of which no material has been seen by the writer. Hieronymus distinguished his species with some care from *M. fragrans* Klatt, although the latter differs at first glance on account of its pedicelled heads, thicker leaves pointed at the base, etc. It would have been much more to the purpose had he given some intimation how his species was to be distinguished from *M. leiostachya* with which it appears to agree in all described points other than pubescence.

M. (§**Corymbosae**) **loretensis**, spec. nov., gracilis volubilis; caule tereti purpureo medulloso; internodiis usque ad 12 cm. vel ultra longitudine; foliis ovatis acutis vel acuminatis chartaceo-subcoriaceis subintegris 6–8 cm. longis 3.5–4.5 cm. latis basi rotundatis supra viridibus pulverulentis vel glabriusculis delicatule reticulatis subtus vix pallidioribus prominulenter reticulatis pinnatim 5-nervatis; nervorum jugo infimo ca. 2 mm. et jugo secundo ca. 1 cm. supra basin orientibus; petiolo tereti purpureo puberulo 1 cm. longo; corymbis convexis compositis 3–12 cm. diametro conjunctim paniculam laxam elongatam folioso-bracteatam formantibus; capitulis 8 mm. longis, ad apices ramorum ultimorum sessilibus et plerisque ternatim glomeratis; bracteolis spatulato-ellipticis petiolatis 3.5 mm. longis; involucri oblongis obtusis 6.6–8 mm. longis firmiusculis dorso glabriusculis basi conspicuiter tumido-callosis; corollis albidis glabris; tubo proprio 2–2.2 mm. longo; faucibus cylindricis 2.3–2.5 mm. longis; dentibus limbi ca. 0.5 mm. longis deltoideis; achaeniis ca. 2.5 mm. longis; pappi setis ca. 50 carneis apice non incrassatis.—PERU: Dept. Loreto, at Iquitos, *E. Ule*, no. 6238 (K., phot. Gr.).

M. (§ **Spiciformes**) **oreopola**, spec. nov., gracilis volubilis; caulibus subhexagonis costulatis puberulis fistulosis; internodiis usque ad 12 cm. longis; foliis ellipticis vel subrhombeo-ovatis longe acuminatis obscure denticulatis 9–11 cm. longis; 4.5–5.5 cm. latis basi obtuse angustatis chartaceo-membranaceis paullo supra basin 5-nervatis utrinque subglabris; nervis inter se per venas numerosas transversas (ut apud folia Melastomacearum) conjunctis; paniculis (vel partialibus in inflorescentia maxima composita) oppositis pedunculatis pyramidatis ca. 14 cm. longis et crassis; ramis valde patentibus fere a basi laxe capituliferis; capitulis arcte sessilibus alternis vel oppositis ca. 5 mm. longis; bracteola minima lanceolata ca. 0.7 mm. longa; involucri squamis oblongis 2.6–3 mm. longis 0.8 mm. latis apice rotundatis dorso minute scabratis basi paullo callosis; corollis 2.5–3 mm. longis; tubo proprio ca. 1.3 mm. longo glandulari-granulato; faucibus turbinato-subcylindricis ca. 1 mm. longis; dentibus limbi deltoideis brevibus ca. 0.4 mm. longis; achaeniis maturis fusco-griseis 2.5 mm. longis deorsum paullo decrescentibus glabris cum angulis pallidioribus; pappi setis ca. 40 plerisque ca. 2.7 mm. longis ad apicem vix vel omnino non incrassatis.—PERU: St. Gavan (or Zavan?), in the mountains, July, 1852, *Lechler*, no. 2315 (K., phot. and fragm. Gr.).

This species rather closely resembles *M. Jelskii* Hieron. and a close comparison of the two is hampered by the fact that while *M. Jelskii* in the Gray Herbarium is represented only by a portion of a somewhat immature inflorescence, the available material of Lechler's plant is past anthesis. However, there are a number of small differences which seem to preclude the likelihood that these plants when better known will prove conspecific. For instance, in *M. Jelskii* the still immature corolla is no less than 4.2 mm. long, while in *M. oreopola* it is from 2.7 to at most 3 mm. in length even at full maturity; in *M. Jelskii* the foliaceous bracts are rounded at base and are pinnately 5-nerved, the second pair of lateral nerves leaving the midrib fully 1 cm. above the base, while in the plant of Lechler the corresponding bracts are smaller, somewhat narrowed to the base and five-ribbed almost from the base; in *M. Jelskii* the the heads are perceptibly though shortly pedicelled, while in *M. oreopola* they are closely sessile. Furthermore the inflorescence and involucral scales in *M. Jelskii* are very pubescent. *M. oreopola* is also closely related to the Brazilian *M. amazonica* Bak. and *M. nigricans* Gardn. but differs from both in its longer petioles, more acuminate leaves, exserted veins, and yellowish-white instead of deeply pink pappus.

M. PARVIFLORA (Aubl.) Karst. Deutsche Fl. 1061 (1883). This

species, first described by Aublet, Pl. Guian. ii. 797, t. 315 (1775), under the singularly inept name of *Eupatorium parviflorum*, is nomenclatorially the oldest of a very difficult group of closely related plants with rather large closely sessile ternately disposed heads. These species are in several cases widely separated geographically and their differences have thus far not been very clearly brought out by their often scarcely contrasting descriptions. With the aid of photographs, fragments, and notes, kindly supplied by Messrs. B. D. Jackson, Rendle, and Lecomte, it has been possible to arrive at a pretty clear idea of the elements of the group and it is believed that the following key will furnish a fairly accurate working hypothesis in their separation.

a. Corolla-teeth one quarter to about one half as long as the throat *b*.
  b. Leaves membranceous, ovate, conspicuously cuneate-decurrent on the long petiole ..... *M. guaco*.
  b. Leaves somewhat firm or rigid in texture, not decurrent on the short petiole *c*.
    c. Leaf-blade broadly elliptical or ovate, at base rounded, merely acutish, or shortly and abruptly acuminate *d*.
      d. Upper surface of leaves rugose and sharply scabrous-pubescent; Colombia ..... *M. dictyophylla*.
      d. Upper surface of leaves with a fine prominulent reticulation; Ecuador ..... *M. Tafallana*.
    c. Leaf-blade lance-oblong, attenuate to each end; Dutch Guiana ..... *M. stipitata*.
a. Corolla-teeth equalling or exceeding the throat *e*.
  e. Petioles 4–6 cm. long, conspicuously winged toward the summit in manner of *M. guaco*; Peru and Bolivia ..... *M. speciosa*.
  e. Petioles mostly short (1–2.5 cm. in length) or if longer not noticeably winged *f*.
    f. Inflorescence distinctly corymbose, the corymbs compound and rounded; leaves not acute at base *g*.
      g. Leaves broadly elliptical, chartaceo-subcoriaceous, merely acutish; corolla-teeth but little longer than the throat; French Guiana ..... *M. parviflora*.
      g. Leaves broadly ovate, submembranaceous, acuminate; corolla-teeth lance-oblong, much exceeding the short throat; Lesser Antilles ..... *M. latifolia*.
    f. Inflorescence subthyrsoid, the corymbs disposed in a somewhat elongated panicle; leaves tomentellous beneath, acute at base *h*.
      h. Corolla-teeth ovate, not much exceeding the campanulate throat; involucral scales not gibbous at base; achenes with ribs prominulent but somewhat double; Cuba ..... *M. oopetala*.
      h. Corolla-teeth lance-oblong, more than twice as long as the throat; involucral scales gibbous-subcalcarate at base; achenes (when fully mature) channelled not ribbed at the angles ..... *M. trinitaria*.

M. (§ **Corymbosae**) **pycnadenia,** spec. nov., herbacea volubilis ramosa; ramis teretibus fulvo-tomentellis foliosis; internodiis nunc 10–12 cm. nunc vix 1 cm. longis; foliis ovatis acuminatis integriusculis obscure remoteque glandulari-denticulatis basi rotundatis margine revolutis 3–6 cm. longis 1.8–2.8 cm. latis fere a basi 5-nervatis crassiusculis firmis duris supra viridibus opacis minutissime puberulis subtus prominenter reticulatis paullo pallidioribus pubescentibus et cum punctis glandularibus minutis rubro-aureis numerosissimis; petiolo tereti ca. 4 mm. longo fulvo-tomentello; corymbis convexis compositis trichotomis 4–8 cm. diametro, particularibus densis conspicue bracteatis; bracteis ovatis foliaceis sessilibus ca. 8 mm. longis; bracteolis similibus sed minoribus; capitulis sessilibus plerisque ternis; involucri squamis anguste oblongis apice rotundatis firmiusculis dorso convexis puberulis glanduliferis ca. 6.5 mm. longis et 1.4 mm. latis; corollis ca. 4.5 mm. longis; tubo proprio primo vix a faucibus subinfundibuliformibus differentiato; dentibus limbi late deltoideis 0.5 mm. longis obscure hispidulis; achaeniis ca. 4.3 mm. longis pallidis puberulis; pappi setis usque ad 65 fulvis.—PERU: in the mountains of Tarapoto, *Spruce* (K., phot. and fragm. Gr.).

M. (§ **Thyrsigerae**) **Rusbyi,** spec. nov., volubilis paullo lignescens; caule tereti usque 5 mm. vel ultra crassitudine dense fulvo-tomentoso post exsiccationem pluricostulato; medulla alba; internodiis 7–12 cm. vel ultra longitudine; foliis ovatis 11–17 cm. longis 5–9 cm. latis submembranaceis gradatim acutatis vel acuminatis integris vel obscure remoteque cuspidato-denticulatis (dentibus ca. 0.2 mm. altis inter se ca. 1 cm. distantibus) supra viridibus pubescentibus (pilis tenuissimis basi incrassatis) subtus dense molliterque fulvo-tomentosis basi cordatis vel (apud folia suprema) rotundatis pinnatim 5-nervatis; nervis jugi secundi supra basin 9–15 mm. a costa media divergentibus; petiolo tereti fulvo-tomentoso 2–3 cm. longo; panicula terminali 2.5–4 dm. longo 9–15 cm. crassitudine tomentosa; bracteis primariis foliaceis, eis superiorum ordinum multo reductis lanceolato-linearibus, ultimis (sub involucris) subulatis vix 2 mm. longis; ramis ramulisque inflorescentiae curvatis vel flexuosis gracilibus; capitulis ca. 1 cm. longis subcymoso-dispositis; pedicellis 1–5 mm. longis; involucri squamis obovato-ellipticis apice rotundatis 5 mm. longis 2.5 mm. latis dorso fulvo-tomentosis; corollis 5–6 mm. longis extus parce hirtis; tubo proprio gracili 2 mm. longo; faucibus campanulatis 3 mm. altis; dentibus limbi deltoideis ca. 0.8 mm. longis apicem versus hispidulis; achaeniis brunneis 4 mm. longis deorsum decrescentibus glabris; pappi setis ca. 30 flavescenti-albidis scabridulis sursum paullulo incrassatis

apice vero attenuatis.—*M. rufa* Britton, Bull. Torr. Bot. Club, xix. 2 (1892), not Benth.—BOLIVIA: Prov. Nor Yungas: Unduavi, alt. 2440 m., Oct. 1885, *Rusby*, no. 1737 (TYPE, N. Y., phot. and fragm. Gr.); at same locality, Nov. 1900, alt. 3300 m., *Buchtien*, no. 3044 (N. Y.).

This plant now known from two specimens, both secured near Unduavi, is certainly distinct from the Colombian *M. rufa* Benth., which has more broadly ovate leaves of much firmer texture, smaller and much denser panicles, and sessile heads. It is a pleasure to associate with this species the name of its discoverer who by untiring efforts has done much to increase the knowledge of several South American floras.

M. (§ **Corymbosae**) **Schultzii**, spec. nov., volubilis vix lignescens; caule tereti sulcato-costulato brunneo primo fulvido-tomentello praecipue nodos versus deinde subglabrato usque ad 5 mm. vel ultra diametro; internodiis 3–17 cm. longis; foliis ovatis acuminatis grosse crenato-serratis (dentibus aliquando 4–5 mm. altis et 5 mm. vel ultra basi latis) cordatis membranaceis utrinque viridibus et puberulis 4–12 cm. longis 3–6 cm. latis a basi 3(–5)-nervatis; petiolo 2–3 cm. longo gracili fulvo-tomentello; corymbis convexis conjunctim inflorescentiam compositam maturitate planiusculam formantibus; axe centrali subracemiforme et conspicue bracteato; pedicellis filiformibus 3–10 mm. longis; involucri squamis oblongis apice rotundatis 5 mm. longis; corollis ca. 4 mm. longis; tubo proprio 2 mm. longo cum glandulis sessilibus munito; faucibus campanulatis ca. 0.9 mm. altis; dentibus limbi lanceolatis ca. 1.3 mm. longis acutiusculis dorso granulatis; achaeniis fusco-brunneis glabris deorsum attenuatis 1.8 mm. longis; pappi setis ca. 40 paullulo sursum incrassatis sordido-albis aetate carneis.—*M. boliviensis* Sch.-Bip. Bull. Bot. Soc. Fr. xii. 82 (1865), nomen nudum, & Linnaea, xxxiv. 535 (1865–66), also without descrip., not Lingelsheim. *Willoughbya scandens* a form "near var. barbinervia" Rusby, Mem. Torr. Bot. Club, vi. 58 (1896).—BOLIVIA: Prov. Larecaja: in the upper (subalpine) part of the wooded region between Queliguaya and Chilieca, near Sorata, alt. 3200–3400 m., *Mandon*, no. 265 (TYPE, Gr., N. Y.). Prov. Nor Yungas: in thickets, Unduavi, alt. 3300 m., *Buchtien*, no. 198 (N. Y.).

M. (§ **Globosae**) **Williamsii**, spec. nov., volubilis paullo lignescens; caule tereti post exsiccationem sulcato-pluricostulato atropurpureo nodos versus (praesertim in panicula) parce tomentello aliter glabriusculo; foliis ovato-oblongis caudato-acuminatis integris margine anguste revolutis basi rotundatis sed ad insertionem petioli paullo

acutatis chartaceo-subcoriaceis 10–15 cm. longis 5–8 cm. latis minutissime utrinque lepidotis pinnatim 5-nervatis; petiolis 2.5–3.5 cm. longis, eis ejusdem jugi inter se per lineam hirtellam conjunctis; paniculla magna composita divaricatim ramosa; capitulis ca. 5 mm. longis sessilibus in glomerulos globosos (2.5 cm. diametro) aggregatis; involucri squamis oblongis obtusis ca. 4 mm. longis dorso minute tomentellis; corollis ca. 4.5 mm. longis; tubo proprio gracili 1.8 mm. longo gradatim in fauces subfusiformes ca. 2.2 mm. longas ampliato; dentibus limbi brevibus vix 0.5 mm. longis; achaeniis 2.7 mm. longis fusco-brunneis in faciebus vix scabratis, angulis paullo pallidioribus; pappi setis ca. 35 distincte sursum incrassatis.—Bolivia: Charopampa, Prov. Caupolican, Dept. La Paz, alt. 488 m., *R. S. Williams*, no. 696 (N. Y., phot. and fragm. Gr.).

M. Williamsii belongs to a small group of rather nearly related but geographically scattered species forming the series to which the writer has applied the name *Globosae*. They are pretty readily distinguished from other members of the genus by having their heads nearly or quite sessile in globular paniculately disposed glomerules. In the following key may be found some of the more obvious differences between the Andean members of this group and certain rather related species of other regions. Much more copious material is needed before such a key can be based upon satisfactory characters.

a. Corolla-teeth lance-oblong, about equalling the campanulate throat; Bolivia ..... *M. desmocephala.*
a. Corolla-teeth deltoid to ovate-lanceolate much shorter than the turbinate or fusiform throat *b.*
b. Bractlets obovate or reversed deltoid, truncate or even retuse at the summit; leaves coriaceous, undulate-margined; Guatemala ..... *M. globosa.*
b. Bractlets elliptic-ovate to ligulate or lance-subulate, rounded to obtusish or even acutish at tip *c.*
c. Leaves ovate-oblong, cuspidate-denticulate, membranaceous; northern Colombia ..... *M. globifera.*
c. Leaves broadly elliptical, subcoriaceous, crenate-serrate; southern Colombia ..... *M. multinervia.*
c. Leaves entire, narrowly revolute at the edge, chartaceous to coriaceous *d.*
d. Leaves firmly coriaceous, the closely netted veins exserted from both surfaces; Brazil ..... *M. smilacina.*
d. Leaves strongly rugose, the veins depressed above and prominent beneath, the lower surface pubescent; Costa Rica ..... *M. Tonduzii.*
d. Leaves neither rugose nor with conspicuously exserted veins, the lower surface glabrous but minutely papillose *e.*
e. Axis of glomerule perceptibly trifid at tip; glomerules about 2.5 cm. in diameter; branchlets of panicle tomentellous; leaves pinnately nerved (second pair of nerves often as much as 1.5 cm. above the base); Bolivia ..... *M. Williamsii.*

e. Axis of glomerule simple, perceptibly elongated; glomerules 1.5–1.8 cm. in diameter; branchlets of panicle obscurely puberulent or almost glabrous; leaves nerved from the base; Brazil. . . . *M. confertissima*

Of this group appear to be also *M. elliptica* DC., *M. laevigata* Sch.-Bip., *M. microlepis* Bak., and *M. pilosa* Bak. of Brazil, as well as *M. brachycarpa* Urb. and *M. Badieri* DC. of the West Indies.

II. THE MIKANIAS OF NORTHERN AND WESTERN SOUTH AMERICA.

BV#46118

Pending a general and monographic treatment of the large genus *Mikania*, it seems well worth while to place on record such local revisions as can be prepared covering with reasonable completeness the species of particular regions. To a considerable extent this has already been done. Thus, Baker in treating the *Compositae* for the Flora Brasiliensis gave a clear revision of the Brazilian species of *Mikania*, so far as they were known prior to 1876, these being no less than 110 in number. Robinson & Greenman, Proc. Am. Acad. xxxii. 10–13 (1896), synopsized the species of Mexico and Central America, including Panama. Later, Robinson, Proc. Bost. Soc. Nat. Hist. xxxi. 254–257, gave a new and somewhat amplified synopsis of the species of Costa Rica. Urban, Symb. Ant. v. 212–233 (1907), has given a carefully keyed descriptive revision of the Mikanias known to occur in the Antilles. Finally, Arechavaleta, Ann. Mus. Nac. Montevid. vi. (Fl. Uruguay iii.) 171–181 (1907), has published descriptions of the ten species of the genus found in Uruguay.

These papers, although very helpful for their respective fields, still leave uncovered large portions of northern and western South America, regions in which the genus *Mikania* is abundantly represented.

The availability of several extensive, not previously identified or at most only partially worked, South American collections has encouraged the here attempted revisions of the Mikanias of Colombia, Venezuela, Ecuador, Peru, and Bolivia. The plan of these treatments is like that employed in the case of the genus *Eupatorium*, namely to give a complete descriptive revision of the species and varieties of Colombia, which has a fairly rich representation of the genus, then in treating those of the other countries to avoid the repetition of descriptions, substituting for them where possible cross-references to previous treatments.

As in former papers of this nature the writer has reached his conclusions chiefly through study of the specimens in the Gray Herbarium and of photographs, sketches, and notes which he made some years ago at several of the larger British and Continental European herbaria. However, loans of the Andean Mikanias from several important herbaria have been of much assistance. Thus their entire Andean representation of the genus was sent by the New York Botanical Garden (rich in the collections of Rusby, Bang, Kuntze, H. H. Smith, Pennell, R. S. Williams, and Buchtien), by the U. S. National Herbarium (containing the Cook & Gilbert series not seen elsewhere), from the Missouri Botanical Garden (together with many sheets for comparative study from Paraguay and Brazil), from the Philadelphia Academy of Natural Sciences, and by the Field Museum. The South American Mikanias in the herbarium of Brown University have also been personally examined.

Through the kindness of Sir David Prain, all the unnamed and doubtful American Mikanias found in the great herbarium of the Royal Gardens at Kew have been sent for examination and have yielded several interesting novelties. Mr. A. B. Rendle of the British Museum of Natural History has most kindly sent at request photographs, sketches, measurements, and notes very helpful in interpreting *Eupatorium parviflorum* Aubl., the type of *M. parviflora* (Aubl.) Karst. Mr. B. Daydon Jackson of the Linnean Society of London has very kindly furnished an excellent photograph of the nearly related West Indian *M. latifolia* J. E. Sm. Similarly, Prof. H. Lecomte of the Museum of Natural History at Paris has most obligingly supplied photographs and authentic bits to show the precise identity of *M. guaco* H. & B. and *M. Tafallana* HBK. A loan of undetermined and doubtful *Compositae-Eupatoricae,* many years ago received for study from the Botanical Garden at Berlin and containing many of Dr. Weberbauer's admirable series of Peruvian Mikanias, has proved very helpful. Prof. L. Diels, Director of the Botanical Garden and Museum at Berlin-Dahlem, has been so kind as to send a portion of the type-material of *M. carnosa* Muschler, a species which seemed in need of some verification. Miss Mary A Day, Librarian of the Gray Herbarium, has given her expert aid on the bibliographical side of this paper.

To all who have thus helped the treatment here presented, the writer is sincerely grateful.

The number of species recognized in the genus *Mikania* has grown very rapidly during the last few decades. In 1873, Bentham &

Hooker, Gen. Pl. ii. 246, placed the probable number at 60. In 1876, Baker treated as valid no less than 110 in the flora of Brazil and some of the bordering countries. In 1890, Hoffmann in Engl. & Prantl, Nat. Pflanzenfam. iv. Abt. 5, 140, assigned 120–150 species to the genus. As a result of preliminary bibliographical work on the genus as a whole, it has been found in connection with the present work that there are now about 273 species of *Mikania* with fair claim to recognition.

No genus of the *Eupatoricae* exhibits a greater variety in the arrangement of the heads, although these themselves are of singular uniformity in the number of florets, nature of the receptacle, number and general form of the involucral scales, etc. The sections proposed by DeCandolle in the Prodromus and repeated with slight modification by Baker in the Flora Brasiliensis are not very satisfactory. They are founded on several uncorrelated features. Thus, some rest on habit (twining or erect stem), some on inflorescence, others on the presence or absence of stipule-like appendages, and still others on leaf-base and leaf-contour. As these features vary quite independently it is by no means surprising that the resulting series are far from being mutually exclusive.

Far better appears the classification suggested by Urban, Symb. Ant. v. 212–215 (1907), in which the genus is divided consistently according to the nature of the inflorescence. This plan has therefore been adopted and somewhat elaborated. It will be evident, however to all who study the genus attentively that there is considerable transition between the different types of inflorescence and consequent need for the cross-references which have been frequently introduced into the keys.

The most difficult question of specific limitation, which has arisen in the course of this work, concerns the well known *M. scandens* (L.) Willd. By recent writers, such as Hooker f., Baker, Oliver, Hemsley, Urban, Hieronymus, and others, who have had occasion to deal with it, this species has been allowed an extroardinarily wide range, including not only Atlantic North America from New England southward, as well as the Gulf States and portions of the Mississippi Basin, but also Mexico, Central America, the Antilles, a large part of South America, tropical Africa, and southern Asia. Its variability has been frequently remarked, but no serious attempt appears to have been made to segragate any of the divergent forms early reduced to its synonymy.

It seemed inherently improbable that a species which was native in

New England would be found also in Central America and the Antilles, not to mention the Andean countries and tropical South America. Accordingly it has been a matter of no great surprise to find that the typical North American *M. scandens* differs from its subtropical and tropical allies in several points. Briefly stated these are as follows: the corolla has a somewhat more ample throat and is apparently always purplish; the inflorescence is rather densely corymbose; the involucral scales are rather narrowly oblanceolate and gradually attenuate to a very sharp tip; the mature achenes are mostly 2.2–2.3 mm. long.

In the South American Mikanias of this group the corollas appear to be uniformly white and are so described by all collectors whose notes on the subject have been available; the involucral scales are obovate-oblong and much more abruptly contracted to a short point; the inflorescence tends on the one hand to be much looser and more irregularly cymose and on the other to be compacted into subglobose glomerules; finally the heads and florets tend in all parts to be smaller than in the North American, the corolla having a less ampliated throat and the achene being mostly less than 2 mm. in length.

As yet the writer has had no opportunity to make detailed study of the Old World material of this affinity. Preliminary examination, however, suggests its probable distinctness both from the North American and South American allies. Presumably it can be disposed under various early specific names, whose types however should have special study which cannot now be given to them.

Most of the South American material of this affinity is here placed in *M. micrantha* HBK., which appears to be the earliest name which can at present be with much confidence associated with it. It is believed that a considerable part of the material from Mexico, Central America, and the Antilles will prove conspecific with the South American *M. micrantha* HBK. On the other hand no evidence has been found that the typical North American *M. scandens*, with its lavender-purple flowers and long narrow and very attenuate involucral scales, reaches any of these regions. It should be added that several forms of this affinity, occurring in Argentina, Paraguay, Uruguay, and southern Brazil, appear unlike those of the Andean region here treated but must await further examination with more complete material than is now available.

COLOMBIA.

The chief records concerning the Colombian Mikanias are, chronologically arranged, as follows:

1781. Linnaeus f., Suppl. 351, described, under the name *Cacalia laurifolia*, a species of *Mikania* which had been collected by Mutis certainly in Colombia though by error recorded as from Mexico.

1804. Willdenow, Sp. Pl. iii. 1742-1748, founded the genus *Mikania*, including fourteen species, of which two, both collected by Mutis, pretty certainly came from Colombia.

1809. Humboldt & Bonpland, Pl. Aeq. ii. 84, t. 105, described and figured *M. guaco*, a Colombian plant.

1820. Kunth in HBK. Nov. Gen. et Spec. iv. 135–139, characterized eight species of *Mikania* as from New Grenada, i. e. Colombia, but of these *M. loxensis* and *M. arborea* clearly came from Ecuador and *M. angustifolia* is now referred to *Eupatorium*.

1844. Bentham, Bot. Sulph. 113, records the collection of *M. angularis* H. & B. at Tumaco on the coast of southwestern Colombia.

1845. Bentham, Pl. Hartw. 201, lists five species of Colombian *Mikania* collected by Hartweg, four being new to science.

1866. Herincq, F., Horticulteur Français, 1866, p. 18, gives a vague horticultural appreciation (quite without scientific diagnosis) of a plant imported from Colombia and introduced into French horticulture under the name *M. Liervalii*, a species not subsequently identified.

1876. Baker in Mart. Fl. Bras. vi. pt. 2, 266, extends to Colombia the range of *M. psilostachya*, var. *racemulosa* (Benth.) Bak.

1887. Klatt in Engl. Bot. Jahrb. viii. 36–37, working on the earliest collection of F. C. Lehmann, enumerates six Colombian Mikanias three of which were proposed as new species.

1894. Hieronymus in Engl. Bot. Jahrb. xix. 45–48, chiefly on the basis of the plants of Lehmann, lists with notes five Colombian Mikanias of which one species and two varieties are proposed as new.

1895. Hieronymus, l. c. xxi. 333, describes *M. Stuebelii* from Colombia.

1898. Cortés, Santiago, in his Flora de Colombia, 117, mentions three species of "guaco," namely *M. radicans*, *M. scandens*, and *M. gonoclada*, but quite without definition.

1901. HIERONYMUS, l. c. xxviii. 576–580, on the basis of the later collections of Lehmann, as well as plants secured by Stübel, lists seven Colombian Mikanias including four new species and one new variety.

1911. ROBINSON, Proc. Am. Acad. xlvii. 197, described as new from Colombia *M. paezensis*, a species here reduced to *M. popayanensis* Hieron.

1914. SCHELLENBERG, SCHINZ, & THELLUNG, Mém. soc. neuchât. Sci. nat. v. 418, record from Mayor's Colombian collection, nos. 252, and 635–637 all as *M. scandens*.

1921. ROBINSON, B. L., finding that the present paper was likely to be delayed beyond expectation placed on published record, Contrib. Gray Herb. lxi. 11–19, three species for Dr. H. H. Rusby, namely *M. clematidiflora*, *M. flabellata*, and *M. globifera*; also the following species proposed by himself, *M. amblyolepis*, *M. miconioides*, *M. Pennellii*, all of which occur within the limits of Colombia.

MIKANIA Willd. Heads homogamous, almost always 4-flowered. Involucral scales 4, equal and for the most part narrowly oblong, with or without a fifth much smaller outermost one (bracteole). Receptacle small, naked, glabrous. Corollas tubular; the proper tube slender, sometimes slightly expanded toward the base by the enclosed nectary; the throat gradually or suddenly enlarged, tubinate or campanulate; teeth of limb 5, deltoid or ovate-oblong or lance-linear, mostly shorter than but sometimes exceeding the throat, usually acutish. Anthers rounded or more rarely emarginate or obscurely subsagittate at the base, provided at the apex with an ovate or oblong appendage. Style-branches elongated and like those of *Eupatorium* either clavellate or filiform. Achenes pentagonal, prismatic or tapering downward. Pappus-bristles capillary, often slightly scabrid or barbellate but never really plumose, free or very slightly connate into a narrow ring at the very base, white, pale buff, or fulvous.—Herbaceous perennials or shrubs, twining or rarely erect. Stem round or hexagonal. Leaves opposite or very rarely verticillate, usually petiolate. Inflorescence paniculate, the heads being spicate, racemose, corymbose, or rarely cymose. Corolla white, pink-purple, or sometimes pale greenish-yellow.—Sp. Pl. iii. 1742 (1804); HBK. Nov. Gen. et Spec. iv. 134 (1820); Spreng. Syst. iii. 421 (1826); DC. Prod. v. 187 (1836); Benth. & Hook. f. Gen. Pl. ii. 246 (1873); Bak. in Mart. Fl. Bras. vi. pt. 2, 217–271 (1876); Hoffm. in Engl. & Prantl, Nat. Pfl. iv. Abt. 5, 140 (1890); Robinson & Greenman, Proc. Am.

Acad. xxxii. 10–13 (1896); Robinson, Proc. Bost. Soc. Nat. Hist. xxxi. 254–257 (1904); Urb. Symb. Ant. v. 212–233 (1907). *Willughbaeya* Neck. Elem. i. 82 (1790). *Carelia* Cav. Anal. Cienc. Nat. vi. 317 (1803), not Adans. *Micania* D. Dietr. Syn. Pl. iv. 1377 (1847), by typ. error. *Corymanthelium* Kunze, Linnaea, xx. 19 (1847). *Moronoa* & *Morrenia* hort. ex Kunze, l. c. *Catophyllum* Pohl ex Bak. in Mart. Fl. Bras. vi. pt. 2, 222 (1876). *Willoughbya* [Neck.] Ktze. Rev. Gen. i. 371 (1891). *Willughbya* [Neck.] Post & Ktze. Lex. Gen. Phan. 594 (1904). Not *Willughbeja* Scop. in Schreb. Gen. i. 162 (1789). Not *Mikania* Neck. Elem. ii. 217 (1790), which being a wholly unjustified renaming of the earlier, well designated, and properly published genus *Perebea* of Aublet, has no possible validity. —A large and characteristic genus of about 273 valid species, of which nearly half are Brazilian.

Key to Series.

a. Heads evenly disposed (spicate or racemose) on the elongated branches of an open panicle *b*.
  b. Heads sessile, spicate.....Ser. I. Spiciformes (p. 27).
  b. Heads pedicellate, racemose.....Ser. II. Racemosae (p. 30).
a. Heads in a dense or open usually thyrsoidal panicle, neither clearly spicate, racemose, nor corymbose in their arrangement.....Ser. III. Thyrsigerae (p. 32).
a. Heads in compound flattish to strongly convex usually dense corymbs or rarely in lax open cymes....Ser. IV. Corymbosae (p. 39).
a. Heads in dense spherical or subglobose glomerules Ser. V. Globosae (p. 49).

Ser. I. Spiciformes DC. Heads sessile, spicate; the spikes commonly branched near the base, disposed in loose and open panicles. —Prod. v. 190 (1836). *Spicaeformes* Benth. Pl. Hartw. 201 (1845).

Key to Species.

a. Leaves cordate *b*.
  b. Leaves softly membranaceous, with wide and open basal sinus.....1. *M. bogotensis*.
  b. Leaves rigid-coriaceous, with narrow or closed sinus....15. *M. rufa*.
a. Leaves not cordate, firmly membranaceous to coriaceous *c*.
  c. Leaves smooth or nearly so on the upper surface *d*.
    d. Achenes 4–5 mm. long.....2. *M. clematidiflora*.
    d. Achenes about 2 mm. long *e*.
      e. Ultimate branchlets of the panicle bearing only 3–7 spicately arranged heads; involucral scales not narrowed toward the rounded tip *f*.
        f. Leaves firmly coriaceous, thickish, about 3–5 cm. wide, the veinlets immersed or depressed on the upper surface.....13. *M. sylvatica*.

f. Leaves scarcely coriaceous, about 6 cm. wide, the veinlets prominulent on the upper surface. ...14. *M. miconioides.*
e. Ultimate branchlets of the inflorescence bearing about 11–15 spicately arranged heads; involucral scales narrowed toward an obtusely pointed tip. .3. *M. leiostachya.*
c. Leaves very scabrous above. .....4. *M. psilostachya.*

1. **M. bogotensis** Benth. Slender, nearly or quite smooth; leaves ovate, acuminate, subcordate, thin, glandular-atomiferous, not reticulated, 3-nerved from the base; petiole 3–4 cm. long, slender; panicle large, open, the floriferous branchlets 7–9 cm. long, commonly with 1–3 shorter branchlets near the base; heads sessile, about 5 mm. high; involucral scales narrowly oblong, obtusish; corollas with slender tube, exceedingly short throat and ovate-oblong acutish spreading teeth; pappus rufous.—Pl. Hartw. 201 (1845); Robinson, Proc. Bost. Soc. Nat. Hist. xxxi. 254 (1904).

CUNDINAMARCA: at the Hacienda de Palmas, near the town of Guaduas, *Hartweg*, no. 1109.
[Costa Rica.]

The species is here interpreted from Pittier's Costa Rican no. 12,030, the identity of which with *M. bogotensis* was some years ago confirmed by Dr. Otto Stapf at the Kew Herbarium, where the type-material was accessible for comparison.

2. **M. clematidiflora** Rusby. Twining, very smooth throughout; stem attaining 4–5 m. in length, slender, round; internodes 4–7 cm. long; leaves ovate, acuminate to an obtuse mucroniform or caudate tip, rounded to barely pointed at base, obsoletely undulate, coriaceous, 7–9 cm. long, 3–5 cm. wide, green, glabrous and somewhat reticulated on both surfaces, 5-nerved, the outer lateral nerves essentially basal, submarginal, small, the chief lateral nerves arising at the base but running close to the midrib to points 6–19 mm. above the base, then diverging suddenly; petiole 15–22 mm. long, slender, flexuous, glabrous; panicle terminal 1.2–2 dm. high, 1–1.8 dm. thick, leafy-bracted at base; primary branches ascending, the secondary divaricate; heads slender, about 1 cm. long, sessile, usually opposite or terminal, the pairs separated by intervals of 8–15 mm.; bractlets ovate-lanceolate, acuminate, about 2 mm. long; involucral scales linear, the upper third of thinner texture, somewhat narrowed and ciliate; achenes slender, 4.5 mm. long, olive-brown, slightly granulated on the faces; pappus-bristles about 35, whitish; corollas white, the proper tube 0.8 mm. long, throat 3 mm. long, subcylindric, teeth deltoid, 0.5 mm. long.—Rusby in Robinson, Contrib. Gray Herb. lxi. 13 (1920).

MAGDALENA: rare, in thickets near stream, Las Nubes, alt. 1373 m., *H. H. Smith*, no. 634 (Gr., N. Y., Mo.).

A neat and attractive species closely related to the broader-leaved variety of *M. Stuebelii* Hieron. (a species which, so far as seen, has a rusty-hirsutulous inflorescence, shorter-petioled and mostly narrower leaves, and less tendency to a spicate arrangement of the heads on the ultimate divisions of the panicle), to the Costa Rican *M. Pittieri* Robinson (also with decidely pubescent panicle and narrower, more caudate-acuminate leaves), to the Ecuadorian *M. Jamesonii* Robinson (with leaves coarsely few-toothed and scarcely any tendency toward a spicate arrangement of the heads), and to several Brazilian species. In all these species the heads are slender and widely spreading, three being closely sessile at the tip of each branchlet of the panicle and accompanied sometimes, but not always, by one or (very rarely) two pairs of opposite and sessile or nearly sessile heads borne somewhat below on the same branchlet. This is pretty clearly not a spike but a determinate inflorescence probably cymose in which the lateral elements have lost their pedicels. These species, geographically remote though clearly related and of doubtful distinctness, form puzzling intermediates in dividing the genus into sections, since they exhibit every transition from the §*Spiciformes* to the §*Thyrsigerae*.

3. **M. leiostachya** Benth. Vigorous twiner, smoothish but never entirely glabrous (as incorrectly stated in the original diagnosis); stem round, solid, pithy; leaves ovate, acuminate, rounded at base, entire, subcoriaceous, 6–24 cm. long, 3–13 cm. wide, reticulated on both surfaces, more or less puberulent on the veins beneath; petioles 1–3.5 cm. long; panicle large, 3 dm. high and thick; its branches curved-ascending, the ultimate branchlets mostly 3–5 cm. long; heads about 7 mm. long, sessile, spicate; involucral scales ovate-oblong, obtuse, shining and nearly smooth to dull and moderately pubescent, about 4 mm. long; corollas white, glabrous, the tube 1.7 mm. long, throat subcylindric, 1.4 mm. long; achenes dark, shining, glabrous, 2 mm. long; pappus white.—Pl. Hartw. 201 (1845); Hemsl. Biol. Cent.-Am. Bot. ii. 103 (1881); Robinson & Greenman, Proc. Am. Acad. xxxii. 12 (1896); J. D. Sm. Enum. Pl. Guat. v. 41 (1899); Robinson, Proc. Bost. Nat. Hist. xxxi. 255 (1904).

MAGDALENA: rare, in forest near Onaca, alt. 916 m., *H. H. Smith*, no. 630 (Gr., N. Y., U. S., Mo., Philad., Field Mus.); locally common in damp forest near Bonda, alt. 250–750 m., *H. H. Smith*, no. 914 (Gr., N. Y., U. S., Mo., Philad., Field Mus.).

CUNDINAMARCA: on the descent from Guaduas to Honda, *Hartweg*, no. 1110.

EL VALLE: La Paila, *Holton*, no. 325 (N. Y.).

DEPT. NOT INDICATED: La Ceja del Quindio, Cordillera Central, alt. 3300 m., *André*. no. 2205 (Gr.).

[Panama and Cent. Am.; also Ecuad.]

4. **M. psilostachya** DC. Vigorous shrubby twiner, attaining 5 m. in length; the terete solid stems, petioles, and inflorescence rusty-velvety; leaves elliptic-oblong, acuminate, narrowed to a rounded or barely acutish base, subentire or undulate or obscurely crenate-serrate, 1–1.3 dm. long, 4.5–5 cm. wide, thick, of harsh texture, above scabrous on the bullate surface and rusty-pubescent on the nerves; veins about 4 pairs, pinnately disposed; petiole 1–1.5 cm. long; panicle of a terminal and 4–6 spreading lateral spikes, these all simple or nearly so, short-peduncled and moderately dense, 4–10 cm. long; heads sessile (or the lowest subpedicellate), about 9 mm. long, widely spreading; involucral scales oblong, dorsally rusty-pubescent and somewhat glandular, the apex thin, acute, spreading or hooked, sometimes marcescent; corollas white, with short proper tube and relatively long turbinate-subcylindric throat; achenes usually covered with sessile globules; pappus white or in age turning to dull salmon.—Prod. v. 190 (1836); Poepp. in Poepp. & Endl. Nov. Gen. ac Spec. iii. 54 (1845); Bak. in Mart. Fl. Bras. vi. pt. 2, 265 (1876).

Magdalena: a single individual at edge of forest, Onaca, alt. 762 m., *H. H. Smith*, no. 2504 (Gr., N. Y., U. S., Mo., Philad., Field Mus.).
Meta: thicket, alt. 500 m., Villavicencio, *Pennell*, no. 1385 (Gr., N. Y.).
[Braz., Guiana, Peru.]

On the basis of Lehmann's no. 7495, Hieronymus in Engl. Bot. Jahrb. xix. 48 (1894), records this species as from "fruticetis montium Montaña de Mismis prope Anserma vieja, prov. Cauca, alt. s. m. 1800–2300 m." Of Lehmann's no. 7495 a single sheet (N. Y.) has been seen by the writer. It appears, in fact, to be of this species but an unusually smooth form with stems early glabrate and leaves neither scabrous above nor rugose. However, the label bears quite different data of collection, namely, "In Pacho, Cundinamarca, 1700–2200 m., Jan. 1892." Thus, although this Colombian form is much smoother than any heretofore described, the inconsistent and doubtless confused data of collection render it undesirable to found even a variety upon the material at hand.

Ser. II. Racemosae. Heads pedicellate, racemosely distributed on the branches of an open panicle, the racemes often branched toward the base.

Key to Species.

Shrubby; leaves firmly coriaceous; achenes about 3.5 mm. long.....5. *M. fragrans.*

Essentially herbaceous; leaves membranaceous or nearly so; achenes 2.2–2.6 mm. long
Leaves entire, not angled at base; individual racemes 5–8 cm. long.....6. *M. Houstoniana.*
Leaves dentate and with acute to acuminate divergent angles slightly above the base; individual racemes 1–2.5 cm. long.....22. *M. Pennellii.*

5. **M. fragrans** Klatt. Shrubby, with long weak climbing shoots; branches terete, closely puberulent; leaves ovate to obovate, obtuse or obtusish at apex, cuneate to bluntly pointed at base, 6–12 cm. long, 3.5–7 cm. wide, coriaceous, glabrous, prominulently reticulate-veiny, above dark-green, shining, beneath paler, dull; petiole thick, 1–2 cm. long, glabrous; panicle ovoid, 2–2.5 dm. high, 1 dm. thick, dense, rusty-pubescent; heads racemose; pedicels about 2 mm. long, pubescent; involucral scales oblong, obtuse, usually smooth except toward the somewhat narrowed tip; corollas greenish-white, the proper tube slender, glandular, 1.6 mm. long, the throat campanulate, about 0.7 mm. high, the teeth oblong-ovate, 1 mm. long; achenes smooth or nearly so, brown, 3.5 mm. long; pappus dull-white, thickened toward the summit.—Klatt in Engl. Bot. Jahrb. viii. 36 (1887).

ANTIOQUIA: woods, near Cuchillas, between Amalfi and Carolina, alt. 2000 m., *Lehmann*, no. CVII. (Gr.).

6. **M. Houstoniana** (L.) Robinson. Subherbaceous or soft-woody twiner with round weak fistulose puberulent to spreading-pubescent stems 2 m. or more in length; leaves broadly ovate, thin, entire, acuminate, rounded to a sometimes slightly pointed base, puncticulate, essentially glabrous, 7–13 cm. long, 5–10 cm. wide, 5-nerved from near the base; petiole 2.5–3 cm. long; panicle large, compound, loose; heads small, 4–6 mm. high, loosely racemose on the straightish branches; pedicels filiform, scattered, 2–3 mm. long, puberulent, about equalling or considerably exceeding the small lanceolate bractlets; involucral scales oblong, subacute, sparingly puberulent especially toward the thin tip, 3–4.5 mm. long; pappus whitish.—Proc. Am. Acad. xlii. 47 (1906). *Eupatorium Houstonianum* L. Sp. Pl. ii. 836 (1753). *E. Houstonis* L. Syst. Nat. ed. 10, 1204 (1759), & Sp. Pl. ed. 2, ii. 1127 (1763) excl. syn. Mill *E. fruticosum* Mill. Dict. no. 6 (1768). *M. Houstonis* (L.) Willd. Sp. Pl. III. 1742 (1804); DC. Prod. v. 190(1836); Hemsl. Biol. Cent.-Am. Bot. ii. 103 (1881); Robinson, Proc. Bost. Soc. Nat. Hist. xxxi. 255 (1904). *Willoughbya Houstonis* (L.) Ktze. Rev. Gen. i. 372 (1891).

MAGDALENA: thickets and forest near stream, common at Las Nubes, alt. 1373 m., *H. H. Smith*, no. 633 (Gr., N. Y., U. S., Mo., Philad., Field Mus.). [Mex., Cent. Am., Boliv.]

In Mr. Smith's no. 633, the only material of this plant as yet available from Colombia, the upper leaves only are shown and these appear somewhat more oblong and caudate-tipped than in Mexican and Central American specimens. Mr. Smith's notes state that the lower leaves are "but little larger than those on the specimen and cuneiform." More complete material may disclose a distinguishable variety, but in all essential characters the correspondence is pretty close.

Ser. III. THYRSIGERAE. Heads in large pyramidal and mostly dense or thyrsoidal panicles, not conspicuously spicate, racemose, corymbose, nor cymose, in their arrangement.

KEY TO SPECIES.

a. Leaves triangular-ovate, cordate and with a spreading or deflexed acuminate lobe on each side *b.*
  b. Lateral lobes of the leaf deflexed-spreading, basal; heads in open panicle; oblong-lanceolate teeth of corolla much exceeding the very short throat.....7. *M. angularis.*
  b. Lateral lobes of the (well developed cauline) leaves distinctly above the base; heads in a glomerate panicle; deltoid-ovate teeth of corolla scarcely equalling the well developed campanulate throat.....8. *M. punctata.*

a. Leaves entire, shallowly repand, crenate, or dentate, not conspicuously angled or lobed *c.*
  c. Throat of corolla campanulate, as wide as high, spreading abruptly from summit of slender tube *d.*
    d. Leaves glabrous on both surfaces, abruptly narrowed to a somewhat pointed base.....5. *M. fragrans.*
    d. Leaves strongly pubescent to silky-tomentose at least on lower surface, rounded or often cordate at base *e.*
      e. Leaves 16–20 cm. long, scarcely half as wide, conspicuously caudate-acuminate, rufous-tomentose beneath..... 9. *M. Ruiziana.*
      e. Leaves 8–12 cm. long, about two-thirds as wide, merely acute or shortly acuminate.....10. *M. lanuginosa.*
  c. Throat of the corolla turbinate or subcylindric, higher than wide, sometimes not sharply differentiated from the tube *f.*
f. Leaves entirely glabrous or at most obscurely puberulent beneath; heads sessile or nearly so *g.*
  g. Cauline (not upper rameal) leaves deeply cordate 31. *M. acutissima*
  g. Leaves not cordate *h.*
    h. Involucral scales usually ciliate and on the back, slightly pubescent toward the tip only *i.*

i. Branchlets of the inflorescence glabrous; petioles of the cauline leaves 2 cm. or more in length
2. *M. clematidiflora*.
i. Branchlets of the inflorescence finely pubescent; petioles of the cauline leaves 6–10 mm. long.....11. *M. Stuebelii*.
h. Involucral scales evenly pubescent or puberulent-scabrid on the back throughout *j*.
j. Leaves 4–5 cm. long, obtuse; involucral scales linear-oblong, 5–7 mm. long.....12. *M. laurifolia*.
j. Leaves 10–14 cm. long, somewhat acuminate to an acute or obtuse tip; scales elliptical, 3–4 mm. long *k*.
k. Leaves firmly coriaceous, thickish; veinlets immersed on upper surface.....13. *M. sylvatica*.
k. Leaves scarcely coriaceous; veinlets exserted on upper surface.....14. *M. miconioides*.
f. Leaves coarsely pubescent or villous at least beneath *l*.
l. Heads sessile *m*.
m. Leaves acuminate, the cauline deeply cordate with narrow sinus.....15. *M. rufa*.
m. Leaves obtusish at both ends.....16. *M. Aristei*.
l. Heads pedicelled; leaves acute at base.....17. *M. nemorosa*.

7. **M. angularis** H. & B. Twining, lignescent, nearly smooth but with traces of rusty pubescence; stem terete; leaves triangular-hastate, acute to acuminate, 1–1.3 dm. long and equally wide at the shallowly cordate or subtruncate base, 3–5-nerved from the slightly acuminate insertion; lateral angles acute to acuminate, the margin entire or undulate; petiole slender, 5–8 cm. long; panicle ovoid, compound, 1–3 dm. long, leafy-bracted, more or less rusty-puberulent; pedicels 2–3 mm. long, bracteolate at the summit; bracteoles ovate-lanceolate, one-third as long as the involucre; heads 9–10 mm. high; corollas white, the proper tube slender, exceeding the throat and relatively large ovate-oblong teeth; pappus white.—Pl. Aeq. ii. 87, t. 106 (1809), DC. Prod. v. 202 (1836); Benth. Bot. Sulph. 113 (1844); Bak. in Mart. Fl. Bras. vi. pt. 2, 245 (1876).

Nariño: Tumaco, *Hinds*, acc. to Benth. l. c.
[Ecuad., Peru, and acc. to Bak. l. c. Dutch Guiana.]

8. **M. punctata** Klatt. Vigorous subherbaceous or soft-woody twiner; stems fistulose, somewhat spreading-pubescent, terete, after drying costate; leaves ovate to triangular, membranaceous, 5(–7)-nerved from the base, the cauline 12–16 cm. long, 15–20 cm. wide, deeply cordate with an open sinus, undulate-dentate, acuminate at apex and with a similar acumination on each side well above the base, punctate and on the under surface rusty-pubescent along the nerves

and chief veins; petioles slender, 8–12 cm. long, puberulent to tomentellous, connected by a prominent ridge at base; rameal leaves triangular-ovate, rounded or subtruncate at base, sometimes slightly hastate; panicle compound, leafy-bracted, puberulent to brownish-pubescent; pedicels short; heads subglomerate at the ends of the branchlets; involucral scales linear-oblong, obtuse, about 5 mm. long, striate, thinner and pubescent toward the slightly narrowed tip; corollas white, glabrous, about 5 mm. long, with slender proper tube, the turbinate-campanulate throat about equalling or scarcely exceeding the limb; achenes fuscous, slender, smooth, about 3.6 mm. long; pappus-bristles about 25, dull white, at length with a reddish tinge.—Bull. Soc. Bot. Belg. xxxi. 195 ("1892" [1893]). *M. vitifolia* Hieron. in Engl. Bot. Jahrb. xix. 46 (1894), not DC.

ANTIOQUIA: frequent in open bushy places near Frontino, alt. 1000–1700 m., *Lehmann*, no. 7243 (N. Y.).

MAGDALENA: near Santa Marta, alt. 1220 m., *H. H. Smith*, no. 635 (Gr., U. S., Mo., Brown Univ., Philad., Field Mus.) and alt. 763 m., no. 915 (Gr., U. S., Mo., Brown Univ., Philad., Field Mus.).

[S. Mex., Costa Rica, Guat., Brit. Hond., Venez.]

According to Lehmann the flowers are greenish-white and fragrant.

9. **M. Ruiziana** Poepp. Woody or, it is said, sometimes herbaceous climber, tawny-villous to rufous-tomentose; stems and branches round; internodes elongated; leaves bright green, ovate, caudate-attenuate, entire or undulate-dentate, the mature cauline cordate by a narrow sinus, submembranaceous to coriaceous and rigid, about 2 dm. long, one-third to more than half as wide; the rameal leaves tending to be ovate-oblong, rounded at base; petioles 1–2 cm. long, conspicuously villous-tomentose; panicle large, at length rather loose; pedicels slender, rather short or nearly equalling the involucre; bractlets thin, villous, ovate-oblong, often surpassing the linear-oblong almost glabrous involucral scales; flowers very fragrant; corollas white, with slender proper tube about equalling the (at maturity) turbinate-campanulate throat and limb; achenes glabrous; pappus rufescent (at least in age).—Poepp. in Poepp. & Endl. Nov. Gen. ac Spec. iii. 53 (previous to July, 1845); Klatt in Engl. Bot. Jahrb. viii. 36 (1887). *M. caudata* Benth. Pl. Hartw. 201 (Oct. 1845).

CAUCA: in small woods on river banks about Tambo and Chapa, alt. 1650–1900 m., *Lehmann*, no. 3589 (Gr.); forests in highlands of Popayan, alt. 1500–2000 m., *Lehmann*, no. B. T. 604 (Gr.).

CUNDINAMARCA: near Guaduas, Prov. Bogotá, *Hartweg*, no. 1112 (K., phot. Gr.).

DEPT. UNKNOWN: *Triana*, no. 1245 (K.).

[Ecuad., Peru.]

Varying as follows:

Var. α. **typica.** Stems densely villous-lanate or -tomentose; mature cauline leaves rather broadly ovate, often more than half as wide as long; petioles stout; bracteoles mostly shorter than the involucre.—Syn., lit., and exsicc. as above.

Var. β. **Lehmanniana** Hieron. Less densely villous; mature cauline leaves oblong-ovate, scarcely more than one-third as wide as long, subentire to distinctly undulate-dentate; petioles considerably more slender than in the preceding; bracteoles surpassing the involucre.—Hieron. in Engl. Bot. Jahrb. xix. 45 (1894).

Tolima: thickets near Dolores, alt. 1000–1800 m., *Lehmann*, no. 7483 (N. Y.).

Meta: shrubby vine in thicket, alt. 500 m., *Pennell*, no. 1375 (Gr., N. Y.).

10. **M. lanuginosa** DC. Robust twining shrub; stems terete, solid, clothed in dense matted wool; pith white; internodes 7–20 cm. long; leaves ovate, acute, obscurely undulate-dentate, cordate or the uppermost rounded at base, subcoriaceous, above green and pilose, beneath densely canescent-lanate or -sericeous, 8-12 cm. long, 6–8 cm. wide, subpinnately veined; petiole stout, subterete, densely canescent-lanate, 1–4 cm. long; panicles terminal, compound, 3–6 dm. long, leafy-bracted; partial inflorescences pedunculate, ovoid-pyramidal; pedicels slender, pubescent, 1–3 mm. long; bractlets ovate-lanceolate or oblong, thin, villous, borne somewhat above the middle of the pedicel, one-third to one-half as long as the oblong acutish often dorsally villous scales of the involucre; corollas about 4 mm. long, white, the proper tube slender, about 2 mm. long, the campanulate throat and ovate teeth each about 1 mm. long; achenes smooth, 3.5 mm. in length, dark-brown with lighter-colored angles; pappus yellowish-white, often (but not always) perceptibly thickened at the tip.—Prod. v. 201 (1836); Bak. in Mart. Fl. Bras. vi. pt. 2, 261 (1876). *M. Banisteriae* Klatt in Engl. Bot. Jahrb. viii. 36 (1887), not DC. *M. antioquiensis* Hieron. in Engl. Bot. Jahrb. xxviii. 580 (1901). *M. Karsteniana* Klotzsch ex Hieron. l. c. 581, nomen subnudum.

Antioquia: in dense woods of the savannahs, Santo Domingo, Canecín, and Amalfi, alt. 1500–2000 m., *Lehmann*, no. XCVII. (Gr.).

Department not indicated: *Karsten* acc. to Hieronymus. l. c.; in clayey soil of the western Cordillera, alt. 1200 m., *Langlassé*, no. 62 (Gr.).

A striking species, the stem enveloped in an exceptionally dense indument and the leaves varying from silky to shaggy-woolly beneath. Hieronymus has tried to use the apical thickening of the pappus-bristles as a differential character in the group; but material now

available for comparison shows this trait vague and untrustworthy, being apparently dependent at least in part on the stage of development and in no way correlated with differences of greater moment. Similarly the degree of silkiness or woolliness in the pubescence or the extent to which it turns from white to yellowish in drying appear to be merely matters of individual variation.

11. **M. Stuebelii** Hieron. Climbing, glabrous except in the inflorescence; leaves lanceolate to ovate, attenuate-acuminate at the apex, shortly cuneate to obtuse at base, 4.5–7 cm. long, 2–4.5 cm. wide, coriaceous, obscurely and remotely cuspidate-denticulate, slightly shining, subtrinervate, the lateral nerves leaving the midrib about 1 mm. above the base; panicle terminal, loose, compound, ovoid, rusty-puberulent or -tomentellous; heads about 9 mm. long, subsessile, usually in 3's at the ends of the branchlets; bractlets linear, about two-thirds as long as the linear-oblong scales; these glabrous and somewhat firm in texture except toward the slightly narrowed and thinner ciliate and often puberulent tip; corollas about 5 mm. long, the proper tube slender, shorter than the subcylindric-campanulate throat, the teeth short; achenes about 4 mm. long, dark-olive, slightly puberulent on the faces; pappus-bristles 40–50, yellowish-white.—Hieron. in Engl. Bot. Jahrb. xxi. 333 (1895).

CAUCA: near El Tambo on Mt. Munchique not far from Popayan, alt. 3000 m., *Stuebel*, no. 320 (Brl., fragm. Gr.).
TOLIMA: in forest, alt. 2100–2500 m., Murillo, *Pennell*, no. 3182 (Gr., N. Y.).
ANTIOQUIA: *Kalbreyer*, no. 1617 (K.).
DEPT. UNKNOWN: *Triana*, no. 1242 (K.), approaching var. *latifolia*.

Varies thus:

Var. α. **typica**. Leaves lanceolate, about one-third as wide as long, obscurely denticulate or entire.—Lit. and exsicc. as above.

Var. β. **latifolia** Hieron. Leaves ovate, more than two-thirds as wide as long (6×4.5 cm.), more decidely dentate.—Hieron. l. c. xxviii. 577 (1901).

CAUCA? in dense forests of the western Popayan Andes, alt. 2500–2900 m., *Lehmann*, no. 5970.

12. **M. laurifolia** (L. f.) Willd. Shrubby twiner, smooth up to the inflorescence; stems at maturity fistulose; internodes 2–6 cm. long; leaves elliptic-ovate, entire, firmly coriaceous, green on both surfaces and shining above, punctate beneath, 3(–5)-nerved from near the base, 3.5–5.5 cm. long, half as wide; petiole 5–9 mm. long; panicles terminal, dense, thyrsoid; heads shortly pedicelled in subspherical glomerules; involucral scales linear, dorsally villous, 5–7 mm. long, acutish;

corollas white, glabrous, the campanulate-subcylindric throat considerably exceeding the limb or the short proper tube; achenes glandular; pappus whitish.—Sp. Pl. iii. 1746 (1804); HBK. Nov. Gen. et Spec. iv. 137, t. 350 (1820). *Cacalia laurifolia* L. f. Suppl. 351 (1781).

Cundinamarca: Guadalupe, *Bros. Apollinaire & Arthur*, no. 23 (Gr.); in wet meadow, southwest of Las Cruces, alt. 2600–2700 m., *Pennell*, no. 2173 (Gr., N. Y., Mo., Field Mus.); grassy hillside, southwest of Sibate, alt. 2700–2800 m., *Pennell*, no. 2400 (Gr., N. Y.).

Tolima: in temperate region, near Mariquita, alt. 976 m., *Humboldt & Bonpland.*

Dept. unknown: *Mutis* (Linn. Soc., phot. Gr.); *Triana*, no. 1253 (N. Y., K.).

Apparently endemic to central Colombia.

13. **M. sylvatica** Klatt. Fruticose, twining; stems terete; branches leafy, at first rusty-tomentellous, later glabrate; internodes 1–4 cm. long; leaves oblong-lanceolate to broadly elliptical, acutish or more often subacuminate to a bluntish tip, entire, obtuse or rounded at base, coriaceous, rigid, above glabrous, puncticulate, rugulose, the netted veinlets slightly depressed, beneath obscurely puberulent, dull green, 1 dm. long, 2.5–5 cm. wide; lateral veins about 3 pairs, the first pair submarginal, the second diverging from the midrib 3–4 mm. above the base, and the third (often alternate) 2–2.5 cm. from the base; petiole stout, 6–10 mm. long, rusty-puberulent or tomentellous; panicle terminal, about 1 dm. high, nearly as thick; heads sessile and spicately disposed on the short divaricate branchlets; involucral bracts obovate, rounded or subtruncate at the tip, about 3.5 mm. long, sometimes as much as 2 mm. wide, minutely roughened on the back, not at all nerved; corollas pubescent, the proper tube, turbinate throat, and erect limb each about 1 mm. long; achenes smooth, brown, about 2 mm. long; pappus-bristles about 30, yellowish-white, slightly thickened toward the summit.—Klatt in Engl. Bot. Jahrb. viii. 37 (1887).

Tolima: in open woods of the savannahs near St. Augustin, alt. 1600 m., *Lehmann*, no. 2301 (fragm. and sk. Gr.).

Dept. not indicated: *Holton*, no. 344 (244) N. Y.; *Triana*, no. 1249 (K.).

14. **M. miconioides** Robinson. Twining shrub; stems often 4–6 m. long, round, fistulose, becoming 8 mm. or more in diameter, rusty-puberulent or at length glabrate; leaves elliptic-oblong, caudate-acuminate, entire or somewhat undulate, rounded at base, 13–18 cm. long, 6.5–7.5 cm. wide, concolorous, above glabrous, delicately prominulent-reticulate, not dark-punctate, beneath puberulent on the veins to nearly glabrous throughout, almost membranaceous to subcoriaceous; lateral veins 3–4 pairs, pinnately disposed, the uppermost pair leaving

the midnerve often as much as 4–6 cm. above the base; panicles ample, pyramidal, 1.5–3 dm. high, nearly as thick, puberulent; heads sessile; involucral scales oblong, rounded at the tip, dorsally puberulent, 3–3.5 mm. long; corollas puberulent, the turbinate-campanulate throat longer than the proper tube or than the teeth; achenes 2 mm. long, tapering downward, dark, with lighter-colored ribs, obscurely puberulent toward the top; pappus-bristles about 35, yellowish-white, scarcely thickened upward.—Contrib. Gray Herb. lxi. 19 (1920).

MAGDALENA: thickets near stream and in forest, Las Nubes, alt. 1373 m., *H. H. Smith*, no. 631 (Gr., N. Y., U. S., Mo., Philad., Field Mus.).
CUNDINAMARCA: at the falls of Tequendama, *Holton*, no. 244 (344) N. Y. [Venez.]

This species, although close to the preceding, is readily distinguished by its thinner larger leaves, which are more sharply caudate-acuminate and are marked above by a slightly prominulent reticulation instead of having their veinlets depressed as in *M. sylvatica*.

15. **M. rufa** Benth. Stout climber; stems terete, soft-woody, striate-angulate after drying, the pith white, the internodes 4–15 cm. long; branches densely tawny-tomentose; leaves ovate, acuminate, mucronulate-denticulate, cordate at base with narrow sinus and broad rounded lobes, at first subcoriaceous, at length thick and rigid, 8–12 cm. long, 5–10 cm. wide, subpinnately 5-nerved from near the base, above at first tawny-villous, later merely scabrous, beneath velvety with long tawny hairs; petioles stoutish, tomentose, 1–4 cm. long; panicles terminal and lateral, 1–1.5 dm. long, 6–10 cm. thick, ovoid, densely thrysoid; heads sessile and crowded on the branches; bractlets and in less degree the involucral scales loosely villous; corollas apparently white, glabrous, the proper tube slender, about 1.8 mm. long; throat turbinate, 1.4 mm. long, and the teeth about 0.5 mm. long, glabrous or nearly so; achenes 3 mm. long, tapering downward, finely glandular on the dark-olive faces; pappus sordid, at length rufescent.—Pl. Hartw. 201 (1845).

CAUCA: in the woods, at Huambia, *Hartweg*, no. 1108 (N. Y., sk. and fragm. Gr.); in the Central Andes above Silvia, alt. 2800–3200 m., *Lehmann*, no. 8727 (Gr., N. Y.).

16. **M. Aristei** Robinson (see p. 6). Probably somewhat woody and tending to twine; stem terete, pithy, covered with a dense and spreading brown tomentum; leaves broadly elliptical-ovate, obtuse, cuspidate, rounded or obtuse at base, cuspidate-dentate, green on both surfaces, shortly rusty-hirsute especially on the midrib and veins, 6–7 cm. long, 3.5–5.5 cm. wide; chief lateral veins in 2 pairs, pinnately disposed; teeth about 1 mm. high and 2–7 mm. apart;

petiole 1.6–2 cm long, rusty-tomentose; thyrse oval, about 1.5 dm. long, 1 dm. thick, leafy-bracted to the middle, covered with rusty or somewhat purplish down, heads sessile, glomerate toward the tips of the branchlets; involucral scales about 8.5 mm. long, linear, obtuse, tomentellous on the back; corollas apparently yellowish-white, about 5.5 mm. long; the proper tube glabrous, 1.5 mm. long; throat distinctly enlarged, subcylindric, 4 mm. long, thinly and very shortly villous; teeth 1 mm. long, deltoid, slightly villous on the back; immature achenes about 4.3 mm. long; pappus-bristles about 40.

QUESADA: Páramo de Guasca, 22 Dec. 1919, *Bro. Ariste-Joseph*, no. A480 (Gr.).

17. **M. nemorosa** Klatt. Twining shrub; stems slender, solid, round, somewhat pubescent or (especially near the nodes) slightly setose; leaves ovate, acuminate at both ends, entire, the cauline about 12 cm. long, half as wide, subcoriaceous, feather-veined, very dark green, glabrous and lucid above, dull-green and softly pubescent beneath; petioles 1–2 cm. long; panicles large, compound, leafy-bracted, rusty-pubescent; pedicels mostly 1–3 mm. long, pubescent; bractlets ovate, acutish, pubescent, about half the length of the ovate-oblong obtuse and smoothish involucral scales; corollas white, smooth, the proper tube slender, enlarged at base, 1.4 mm. long, the throat subcylindric, about 2.8 mm. long, the teeth relatively short (0.6 mm. in length); achenes dark-brown with lighter-colored angles and slightly puberulent faces, 3 mm. long; pappus dirty white.—Klatt in Engl. Bot. Jahrb. viii. 36 (1887).

ANTIOQUIA: in woods of savannahs between Lolombo and Caneán, alt. 1200–1800 m., *Lehmann*, no. CIX. (Gr.).

Ser. IV. CORYMBOSAE. Heads in dense compound corymbs or more rarely in lax compound cymose or corymbose panicles.

KEY TO SPECIES.

a. **Leaves cordate or hastate** *b.*
  b. **Heads large; involucral scales about 1 cm. long; corolla-teeth lance-linear, much longer than the throat** ..... 30. *M. lloensis*
  b. Heads middle-sized; involucral scales 6–9.5 mm. long; corolla-teeth deltoid to oblong, shorter than or about equalling the throat *c.*
    c. Leaves bullate-rugose, coarsely crenate, mostly 3–4 cm. wide, shortly acuminate or merely acutish .... 18. *M. popayanensis.*
    c. **Leaves not bullate-rugose, entire or undulate and denticulate, mostly 4–10 cm. wide and gradually acuminate** ..... 19. *M. cordifolia.*
b. Heads small; involucral scales mostly 3–5 mm. long *d.*
  d. Corollas white, the campanulate throat equalling or exceeding the teeth *e.*

e. Involucral scales acute, glabrous, stramineo-subscarious, with slight callus-swelling at base; pedicels and branchlets of panicle angulate; leaves (5–15 cm. long) not dark-punctate.....20. *M. micrantha.*
e. Scales rounded or very obtuse, less scarious, the 2 outer dorsally puberulent; pedicels and branchlets of the inflorescence terete, granulate-puberulent; leaves (at least the upper) small, 1–2.5 cm. long, dark-punctate.....21. *M. amblyolepis.*
d. Corollas greenish-yellow, the teeth considerably longer than the scarcely developed throat; heads usually tending to be racemose or subracemose.....22. *M. Pennellii.*
a. Leaves neither cordate nor hastate *f.*
f. Involucral scales about 3.5 mm. long; leaves entire, feather-veined.....23. *M. nigropunctulata.*
f. Involucral scales 4.5–7 mm. long *g.*
g. Leaves ovate or lanceolate, acuminate *h.*
h. Petioles 5–10 mm. long *i.*
i. Leaves ovate-lanceolate, about one-third as wide as long, membranaceous; heads short-pedicelled 24. *M. Aschersonii.*
i. Leaves ovate, more than half as wide as long, subcoriaceous; heads sessile and glomerate.....25. *M. Lehmanni.*
h. Petioles 3–5 cm. long *i.*
i. Leaf-blade membranaceous, conspicuously decurrent on the petiole; veinlets not prominent beneath.....26. *M. guaco.*
i. Leaf-blade chartaceo-subcoriaceous, rounded at base or but slightly decurrent on the petiole; veinlets prominently exserted and reticulated beneath.....27. *M. dictyophylla.*
g. Leaves broadly elliptical, serrate, obtuse or merely cuspidate, about 7-nerved.....28. *M. multinervia.*
f. Involucral scales 9–10 mm. long *h.*
h. Involucral scales obtuse, glabrous except near the slightly tufted apex; pedicels glabrous .....29. *M. flabellata.*
h. Involucral scales acute, the outer coarsely pubescent, as are the pedicels .....30 *M. lloensis*

18. **M. popayanensis** Hieron. Herbaceous or nearly so, twining; branches at first somewhat 4-angled, densely tomentellous, at length glabrate; internodes much exceeding the leaves; these dull-green, ovate, shortly acuminate, coarsely crenate-dentate, at base cordate from a slight acumination, bullate-rugose, finely pubescent on both surfaces, 3-nerved from a point about 5 mm. above the base, at most about 5 cm. long and two-thirds as wide; petioles tomentellous, 2–5 cm. long; corymbs flattish, on long peduncles exceeding the leaves; pedicels 2–5 mm. long; involucral scales acute, oblong-lanceolate, pubescent, 9–10 mm. long; bractlets about half as long, acutish; corollas light yellowish-green, 5–7.5 mm. long; proper tube glabrous, 3–4 mm. long; throat campanulate, 2–2.5 mm. high; teeth deltoid, glandular or tomentellous toward the tip; achenes 5 mm. long, tapering downward, glabrous; pappus-bristles (acc. to Hieron.) about 80,

reddish.—Hieron in Engl. Bot. Jahrb. xxviii. 579 (1901). *M. paezensis* Robinson, Proc. Am. Acad. xlvii. 197 (1911).

Cauca: in the uppermost wooded region of the Central Cordillera of Popayan, alt. 3000–3500 m., *Lehmann*, no. 5210; Rio Paez basin, *Pittier*, no. 1336 (U. S., phot. Gr.).

19. **M. cordifolia** (L. f.) Willd. Herbaceous or soft-woody twiner; stems and branches hexagonal, gray-tomentellous or -tomentose, often spirally twisted; leaves ovate, acutish to acuminate, cordate with open sinus and wide rounded lobes at base, membranaceous, subentire to undulate-dentate, green and inconspicuously appressed-villous to shortly and densely subsericeous especially beneath, 5–10(–15) cm. long, half to two-thirds as wide, 3(–5)-nerved from the very base; petioles 2–5.5 cm. long, connected at base by a transverse ridge; corymbs terminal and lateral, convex, compound; pedicels mostly 0.5–2 mm. long; bractlets herbaceous, ovate-lanceolate acuminate, grayish-tomentose, often about equalling the heads; involucral scales at maturity substramineous, 6–8 mm. long, acute, dorsally pubescent; corollas white, the throat obconical; achenes glabrous, about 3.5 mm. long; pappus dull white, in age rufescent. — Sp. Pl. iii. 1746 (1804); Urb. Symb. Ant. v. 227 (1907), q. v. for copious literature and synon. *Cacalia cordifolia* L. f. Suppl. 351 (1781). *M. suaveolens* HBK. Nov. Gen. et Spec. iv. 135 (1820). *M. gonoclada* DC. Prod. v. 199 (1836). *Willoughbya cordifolia* (L. f.) Ktze. Rev. Gen. i. 372 (1891).

Magdalena: loosely twining in thickets and clearings especially near streams, common at Las Nubes, alt. 1373 m., *H. H. Smith*, nos. 638 (Gr., N. Y., Field Mus., U. S.) and 2004 (N. Y.); near sea-level about the mouth of the Rio Buritaco, *H. H. Smith*, no. 2003 (Gr., N. Y., U. S., Philad., Field Mus., Mo.), and Don Amo Viejo, alt. 610 m., no. 2005 (Gr., N. Y., U. S., Mo., Philad., Field Mus.).

Bolivar: sand along river, alt. 90–100 m., Cañabetal, *Pennell*, no. 3877 (Gr., N. Y.).

Antioquia: river flat, alt. 150 m., Brazuela de Perales, Rio Magdalena, *Pennell*, no. 3708 (N. Y.).

Santander: alluvial flat, alt. 80–90 m., Badillo, Rio Magdalena, *Pennell*, no. 3906 (N. Y.).

Tolima: Mariquita, *Humboldt & Bonpland*, no. 1669 (Par., phot. Gr.).

Huila: in loam, alt. 450–600 m., Quebrada de Angeles, above Natagaima, *Rusby & Pennell*, no. 301 (N. Y.).

Dept. not indicated: *Triana*, no. 1244 (N. Y.); *Mutis* (Linn. Soc., trac. Gr.).

[Widely distrib. in trop. and subtrop. Am.]

20. **M. micrantha** HBK. An herbaceous or frutescent twiner, smoothish to copiously pubescent; stems (sometimes becoming fistulose) terete, costulate (after drying); leaves thin, light green, ovate,

acuminate, the cauline mostly sagittate or hastate, with deep open sinus, subentire to coarsely crenate-undulate or -dentate, 5–13 cm. long, 3–10 cm. wide, 3(–7)-nerved from the base, almost glabrous, or more often shortly pilose at least on the nerves, rarely villous with long soft hairs; petioles 2–8.5 cm. long, slender, usually pubescent, connected at base by a ring, this sometimes developed into a narrow but submembranaceous stipular expansion; panicles terminal and lateral, compound, cymosely subdivided; pedicels filiform, 0–5 mm. long; heads small for the genus, mostly 4–5.5 mm. long; bractlets lanceolate, acute, borne at the top of the pedicel; involucral scales thin, obovate-oblong, acute to shortly acuminate, greenish-white; corollas white, the slender tube 1.5–1.7 mm. long, the throat campanulate, 1 mm. high, the teeth small, at length recurved; achenes black, 1.7 mm. long, sparingly glandular-atomiferous on the faces; pappus (when fresh) white.—Nov. Gen. et Spec. iv. 134 (1820). *M. scandens* of auth. as to much material from S. Am., not (L.) Willd. *Willoughbya micrantha* (HBK.) Rusby, Mem. Torr. Bot. Club, iv. 211 (1895), at least as to name-bringing synonym. *M. orinocensis* HBK. l. c.

MAGDALENA: common in damp clearings, below 600 m., Bonda, *H. H. Smith*, no. 526 (Gr., N. Y., U. S., Mo., Brown Univ., Philad., Field Mus.); thickets near streams, below 460 m., Calavasa, *H. H. Smith*, no. 639 (Gr., N. Y., U. S., Mo., Brown Univ., Philad., Field Mus.); Quebra and Valparaiso, *H. H. Smith*, no. 917 (Gr., N. Y., U. S., Mo., Brown Univ., Philad., Field Mus.); low lands near Rio Frio, *H. H. Smith*, no. 640 (N. Y.)

BOLIVAR: meadow, alt. 50–80 m., Tierra Alta, on Rio Sinu, *Pennell*, no. 5622 (Gr., N. Y.).

SANTANDER: banana field, alt. 90–100 m., Boca de Rosario, Rio Magdalena, *Pennell*, no. 3896 (Gr., N. Y., Mo., Field Mus.).

META: roadside on slope, alt. 800–1000 m., Villavicencio to Buenavista, *Pennell*, no. 1660 (Gr., N. Y.).

CAUCA: highlands of Popayan, alt. 1500–2000 m., *Lehmann*, no. 5682 (N. Y.).

[Widely distrib. in trop. Am.]

As pointed out above (p. 24) this species differs from *M. scandens* of North America in a variety of points, such as the color of the corollas, form of the involucral scales, size of achenes, nature of inflorescence, etc. Pending investigation of certain old and obscure types, *M. micrantha* is the earliest name which can be with tolerable certainty applied to this tropical species. The plant is variable and passes into several perceptibly different forms quite incapable of sharp definition. Of these the following appear worthy of mention:

Forma α. **typica.** Smoothish or inconspicuously pubescent; corymbs at maturity lax and open, the ultimate branching more or less distinctly cymose.—Synon., lit., and exsicc. as above.

Forma β. **congesta** (DC.), comb. nov. Heads even at maturity sessile or nearly so, the subtending bractlets relatively conspicuous; the inflorescences or their divisions compact, rounded or subglobose.—*M. congesta* DC. Prod. v. 197 (1836). *M. scandens*, var. *congesta* (DC.) Bak. in Mart. Fl. Bras. vi. pt. 2, 249, t. 69 (1876).

MAGDALENA: Santa Marta, *Bulbis* (sk. and fragm. Gr.).
ATLANTICO: Barranquilla, *André*, no. 185 (Gr.).
SANTANDER: alluvial flat, Badillo, Rio Madgalena, alt. 80–90 m., *Pennell*, no. 3907 (Gr., N. Y., Mo.).
[Porto Rico.]

Forma γ. **hirsuta** (Hieron.), comb. nov. Stems, petioles and usually both surfaces of the leaves villous with mostly long sordid-white perceptibly jointed hairs; inflorescence as in forma α.—*M. scandens*, var. *hirsuta* Hieron. in Engl. Bot. Jahrb. xix. 47 (1894). *M. suaveolens*? Benth. Pl. Hartw. 201 (1845), not HBK. *M. scandens* Klatt in Engl. Bot. Jahrb. viii. 37 (1887), not (L.) Willd.

ANTIOQUIA: shrubby woods about Amalfi, alt. 1700 m., *Lehmann*, no. CVIII. (Gr.).
TOLIMA: wet loam, Honda, alt. 200–250 m., *Pennell*, no. 3683 (Gr., N. Y., Mo.).
CUNDINAMARCA: near Villeta, *Hartweg*, no. 1111 (N. Y.).
EL VALLE and CAUCA: near Cali and Quilichao, alt. 1000–1300 m., *Lehmann*, no. 4888, acc. to Hieron. l. c.
[Peru.]

21. **M. amblyolepis** Robinson. Slender twining herbaceous perennial; stems round, microscopically granular-puberulent; leaves (only the upper seen) deltoid-ovate, obtuse and cuspidate, coarsely crenate-dentate, broadly cordate, thin, inconspicuously puberulent on the nerves and toward the edge, dark-punctate on both surfaces, 1–2.5 cm. long, 7–20 mm. wide; petiole 1.6–2 cm. long; panicle as much as 6 dm. long, opposite-branched, loose, its divisions about 1 dm. long, usually alternate-branched and irregularly cymose; pedicels terete, 0.5–2.5 mm. long; bractlets small, borne at the summit; heads 5 mm. long; scales of the involucre obovate or oblanceolate-oblong, rounded or obtuse at the slightly erose tip, about 4 mm. long, the outer pair puberulent on the back, scarcely striate; corollas white, about 2.3 mm. long, smooth, the proper tube 0.8 mm. long, throat turbinate-campanulate, 1.2 mm. long; achenes dark-brown or blackish, 1.7 mm. long, granular on the faces; pappus-bristles about 30, whitish.—Contrib. Gray Herb. lxi. 11 (1920).

BOLIVAR: grassy open places, alt. 70–250 m., Buenavista, east of Sincé *Pennell*, no. 4002 (Gr., N. Y., Mo., Field Mus.).

22. **M. Pennellii** Robinson. Slender twining herbaceous per-

ennial; stems round, smooth, dark-purple; leaves triangular-ovate, subhastately lobed, acuminate, dentate, open-cordate, thin, green on both surfaces, 5-nerved from the base, 6–8 cm. long, 5–6 cm. wide, very finely ciliolate and slightly puberulent; petiole 3–5 cm. long; panicle loose, irregularly compound, puberulent, leafy-bracted, the divisions pedunculate, ovoid, 5–20 cm. long; heads about 6 mm. long, shortly but distinctly racemose on the ultimate branchlets; pedicels 0.5–2.5 mm. long, the bractlet at base, middle, or summit; scales of the involucre oblanceolate, acute, smooth, yellowish-green, mostly 2-costulate, 4.5 mm. long, the ribs confluent into a slight callous swelling at base; corollas greenish-yellow, 2.8 mm. long, the proper tube slender but toward the base distended by a large nectary, the limb subrotate from a scarcely developed throat; achenes 2.6 mm. long, tapering toward the base, dark-gray with lighter angles; pappus-bristles about 26, pale yellowish to erubescent.—Contrib. Gray Herb. lxi. 19 (1920).

META: shaded roadsides between Villavicencio and "Buenavista," alt. 700–900 m., *Pennell*, no. 1649 (N. Y., Gr., Mo.).

Although exhibiting an ultimately racemose inflorescence this species seems best placed with what may be called the *M. scandens* group of Ser. *Corymbosae* with which it appears to have much in common.

23. **M. nigropunctulata** Hieron. Soft-wooded climbing shrub; branches at first villous, later glabrate; internodes sometimes 2 dm. or more in length; leaves ovate to (the upper) lanceolate, acuminate, entire, rounded or shortly cuneate at base subchartaceous, above glabrate except on the nerves, beneath dark-punctate, pinnately nerved (the chief lateral nerves 3–4 on each side, connected by subparallel transverse veins, the surface reticulate-venulose (the veinlets impressed above, slightly prominulent beneath); petiole as much as 2 cm. long; inflorescences 1.8–2.5 dm. long; heads clustered 3–5 together in subglobose corymbous glomerules at the ends of the ultimate branchlets, sessile or on pedicels scarcely exceeding 3 mm. in length; bractlets black-dotted, 2.5 mm. long, ciliate; scales of involucre 7-nerved, the outer oblong, 3.5 mm. in length, 1.25 mm. wide, ciliate, obtuse, penicillate, the inner elliptic, rounded at tip, 3 mm. long, sparingly black-dotted; corolla smooth, 4.5 mm. long, the proper tube 1.25 mm. long, the throat ovoid, about 3 mm. long, the teeth triangular-ovate, tufted at tip, 1 mm. long; achenes (immature) 2.5 mm. long, black-punctate; pappus-bristles about 45, slightly flesh-colored, thickened at tip.—Hieron. in Engl. Bot. Jahrb. xxviii. 578 (1901).

CAUCA: in dense woods on the western slope of the western Andes of Popayan, alt. 1200–1800 m., *Lehmann*, no. 5967.

Not seen; the character here drawn from the original diagnosis.

24. **M. Aschersonii** Hieron. Twining; stems slender, much branched, striate-sulcate, slightly villous when young; internodes as much as 7 cm. long; leaves ovate-lanceolate, long-acuminate, entire, shortly cuneate at base, sometimes as much as 9.5 cm. long and 3.25 cm. wide, glabrous except on the sparingly pubescent nerves, somewhat 7-nerved, the first pair of nerves submarginal, the second starting about 3–5 mm. above the base and extending about half the length of the leaf, the third pair leaving the midnerve 7–10 mm. above the base and reaching nearly to the apex; petiole 5–7 mm. long; inflorescence ample, leafy-bracted; the divisions scarcely longer than the subtending bracts, each bearing 1–2 smaller leaves, dense; branches and branchlets glandular-villous; pedicels scarcely over 1.5 mm. long, glandular-pubescent; bractlets 3 mm. long; heads aggregated by 3–5 at the tips of the ultimate branchlets; involucral scales 4.5–5 mm. long, deltoid at tip, mucronate, scarious, 3-nerved, dorsally covered with dark sessile glands especially toward the tip; corollas smooth, about 4.5 mm. long, the proper tube about 1 mm. long, gradually expanded into a turbinate throat 3.5 mm. long including the deltoid-ovate teeth (0.75 mm. in length); unripe achenes 2.5 mm. long; pappus-bristles about 55, reddish.—Hieron. in Engl. Bot. Jahrb. xxviii. 577 (1901).

CAUCA: in dense woods on the western slope of the western Andes of Popayan, alt. 1300–2000 m., *Lehmann*, no. 5979.

Not seen; the character here compiled from the original description of Prof. Hieronymus.

25. **M. Lehmanni** Hieron. Shrubby climber, with stems as much as 4 m. long; branches round, about 4 mm. thick, reddish-hirsute or -subtomentose, finally glabrate; leaves ovate, shortly acuminate, entire, subrotund or attenuate at base, at most 6–7 cm. long and 3.5–4 cm. wide, subcoriaceous and somewhat rigid, nearly smooth above, sparingly pilose beneath, pinnately nerved, the veinlets reticulated closely, prominent beneath; panicles 1–2 dm. long, 7–8 cm. thick, rufous-pubescent, the lowest branches subtended by foliaceous bracts; heads glomerate at the tips of the branches; bractlets about 2 mm. long; scales of the involucre about 5 mm. long, linear, obtusish ciliate at apex, otherwise glabrous, dark (in dried state) but with paler margins; corollas about 5 mm. long, narrowly funnel-formed, the proper tube about equalling the throat and limb; achenes subcylindric, pubescent; pappus-bristles about 35, slightly reddish.—

Hieron. in Engl. Bot. Jahrb. xix. 46 (1894) where also provided with the alternative and wholly needless name *Willoughbya Lehmanni* Hieron.).

ANTIOQUIA: in dense woods of the high plain, Santa Rosa, alt. 2000-2600 m., *Lehmann*, no. 7468.

Not seen; character condensed from the original diagnosis. Flowers said to be greenish-white and fragrant.

26. **M. guaco** H. & B. Twining, nearly or quite herbaceous to softly woody; stems terete, soon glabrate and smooth, green or purplish-brown, weak and fistulose; internodes 7–18 cm. long; branches round, sordid-tomentellous; leaves ovate, acutish to acuminate, undulate and denticulate to subentire, at base cuneately decurrent upon the petiole from a generally rounded contour, membranaceous, usually thin and of soft texture, large, 1.2–2.1 dm. long, 9–12 cm. wide, above softly puberulent, sometimes obscurely lepidote and scabrid, beneath softly subfulvous-tomentellous especially on the nerves, pinnately veined, the chief lateral veins 3–4 pairs, leaving the midnerve below the middle; petiole of the cauline leaves about 5 cm. long, winged toward the summit; corymbs large, convex or rounded, long-peduncled from the upper axils and together forming a large ovoid panicle; heads about 1 cm. long, mostly sessile by 3's; involucral scales oblong, puberulent on the back and sometimes perceptibly tufted near the rounded tip, green often with a brown or purplish tinge; corolla white, its proper tube slender, 3–3.5 mm. long, the turbinate-subcylindric throat of about equal length, the teeth deltoid, 0.6–0.8 mm. long, bearing a few sessile glands on the back; achenes 3.3 mm. long, tapering toward the base, minutely roughened; pappus-bristles about 65, buff to (in age) fulvous.—Pl. Aeq. ii. 84, t. 105 (1809); HBK. Nov. Gen. et Spec. iv. 136 (1820); Hemsl. Biol. Cent.-Am. Bot. ii. 103 (1881); Robinson & Greenman, Proc. Am. Acad. xxxii. 12 (1896). *M. amara*, var. *Guaco* (H. & B.) Bak. in Mart. Fl. Bras. vi. pt. 2, 237, t. 66 (1876), excluding synon. in part. *Willoughbya guaco* (H. & B.) Ktze. Rev. Gen. i. 372 (1891). *M. olivacea* Klatt, Bull. Soc. Bot. Belg. xxxi. 195 ("1892" [1893]).

MAGDALENA: near Santa Marta on the Rio Piedras and at Agua Dulce, alt. 150–600 m., *H. H. Smith*, no. 916 (Gr., N. Y., U. S., Mo., Philad., Field Mus.).
BOLIVAR and ANTIOQUIA: on banks of the Rio Magdalena between Mahates and Angostura, *Humboldt & Bonpland* no. 1447 (Par., phot. Gr.).
[Cent. Am., Braz., Peru acc. to Bak., and Boliv.]

27. **M. dictyophylla** Robinson (p. 8). Robust shrubby twiner, stems terete, weak, fistulose, scabrid and covered with a short dense

spreading nearly straight dark-purple or brownish-tawny indument; branches also terete; leaves ovate, subacuminate, undulate-denticulate, rounded at base or subdecurrent on the petiole, thickish and of firm texture, pinnately veined, above rugose and sharply scabrous, beneath tomentellous and conspicuously reticulated with exserted veins and veinlets, 1–2 dm. long, 6–14 cm. wide; the lateral veins about 3 pairs, leaving the midrib below the middle; petiole (1.5–)3–4 cm. long; corymbs compound, peduncled and mostly alternate from the upper axils; floral leaves rhombic-ovate, acutish at each end; bractlets lance-linear, acute, 3 mm. long; heads about 1 cm. long, sessile by 3's; involucral scales rigidulous, oblong, rounded and dark-puberulent on the back, also sprinkled with sessile glands; corollas ochroleucous, externally glandular; the proper tube 3 mm. long, gradually expanded into a narrowly turbinate-subcylindric throat of equal length; teeth 0.7–0.9 mm. long; achenes 3.5–4 mm. long, grayish, slightly granulated on the faces, somewhat tapering toward the base; pappus-bristles about 65, dull-white.—Contrib. Gray Herb. n. s. lxiv. 8 (1922).

HUILA: forest, on the Cordillera Oriental, alt. 1300–1800 m., flowers cream-yellow, 1–8 Aug. 1917, *Rusby & Pennell*, no. 1004 (N. Y., phot. and fragm. Gr.).

An imperfect specimen from near the village Dolores in the upper Cauca Valley, 20 April, 1876, *André*, no. 2834 (Gr.), is nearly related to this species, but the leaves are somewhat less prominently reticulated beneath, the corollas said to have a violet tinge, and the pappus (in age) somewhat tawny.

28. **M. multinervia** Turcz. Smooth, twining, shrubby; stems subterete, costate-sulcate (after drying); internodes 1–1.3 dm. long; leaves broadly elliptical, rounded or obtuse at both ends, cuspidate at apex, crenate-serrate, pinnately 7-nerved, of firm texture, subcoriaceous, reticulate-rugulose, 7.5–9 cm. long, about 5.5 cm. wide; petiole 2.3–2.8 cm. long, flexuous; panicle elongated, 3–4 dm. long, 1 dm. thick, interrupted, leafy-bracted; the divisions opposite, pedunculate, bearing reduced foliaceous bracts (1–1.5 cm. long) and short-pedicelled heads in dense subglobose glomerular corymbs; heads about 1 cm. long; scales of the involucre narrowly ovate-oblong, firm, ciliate, slightly tufted near the rounded apex, obscurely tawny-puberulent on the rounded unribbed back; corolla narrowly funnel-formed, about 6 mm. long, the proper tube about equalling the turbinate-subcylindrical throat; achenes (immature) 2.6–2.8 mm. long, covered with sessile globular red glands; pappus white, with pale buff tinge.

Bull. Soc. Imp. Nat. Mosc. xxiv. pt. 2, 59 (1851). *Willoughbya multinervia* (Turcz.) Ktze. Rev. Gen. i. 372 (1891).

Nariño: on the volcano Pasto, *Jameson*, no. 418 (K., photostat negative and fragm. Gr.).

29. **M. flabellata** Rusby. Twining, apparently herbaceous or nearly so; stems sometimes toward 5 m. in length, round, fistulose, weak, striate-costulate and often collapsing after drying, entirely glabrous; internodes 1 dm. or more in length; leaves opposite, broadly elliptic-ovate, acuminate, remotely and obscurely denticulate, rounded at base, 5(–7)-nerved from near the base, about 17 cm. long, 10 cm. wide, thin, membranaceous, when young obscurely puberulent beneath, at maturity glabrous on both surfaces; the nerves connected by transverse (somewhat irregular) veins; inflorescences axillary, compound, pedunculate, 2–3 dm. long, leafy-bracted; the corymbs opposite, peduncled, compound, 4–6 cm. broad, flattish or slightly convex, rather dense, glabrous throughout; pedicels 1–8 mm. long; bractlets herbaceous, spatulate, about 9 mm. long; heads (large for the genus) 15–17 mm. high; involucre scales 10–11 mm. long, oblong-lanceolate, obtusish, mucronulate, 5(–7)-nerved, obsoletely tufted at summit; corollas white, 1 cm. long, narrowly funnel-formed, glabrous, proper tube 4.5 mm. long, throat turbinate, 2.5 mm. long, teeth lance-oblong, 3.5 mm. long, subacute; achenes glabrous, 6 mm. long; pappus-bristles exceptionally numerous, about 175, scabrid, capillary, not thickened toward the tip.—Rusby in Robinson, Contrib. Gray Herb. lxi. 14 (1920).

Magdalena: moderately common in clearings, Sierra del Libano, alt. 1830 m., *H. H. Smith*, no. 2002 (N. Y., Gr., Mo., Field Mus.).

30. **M. lloensis** Hieron. Herbaceous twiner; stems subterete, at first covered with a dull rufous or tawny spreading pubescence; internodes sometimes as much as 1.5 dm. long; leaves opposite, ovate, acuminate, nearly entire or sinuate-dentate, subcordate at base though with a slight acumination at the attachment of the petiole, sordid-pubescent on both surfaces, 4.5 cm. or more in length, 2.5 cm. or more in breadth, membranaceous, 3–5-nerved; petiole 1–2 cm. long; corymbs compound, trichotomous, large, 3 dm. in diameter, leafy-bracted, convex; pedicels slender, 3–9 mm. long, brownish-pubescent; bractlets rhombic-ovate, herbaceous; involucral scales about 1 cm. long, oblong-lanceolate, acuminate, 3-nerved and striatulate, the inner glabrous except near the slightly ciliate apex, the outer coarsely pubescent on the back; corollas glabrous, the proper tube 3–4.5 mm. long; the throat scarcely any; teeth oblong-linear, at full maturity

3.5 mm. long, spreading; achenes glabrous, grayish-black, with lighter angles, 5.5 mm. long; pappus-bristles numerous but variable in number (58–143), yellowish-white, in age salmon-colored.—Hieron. in Engl. Bot. Jahrb. xxix. 18 (1900).

CUNDINAMARCA: Bogotá, *Bro. Ariste-Joseph*, no. A277 (U. S., phot. and fragm. Gr.).
[Ecuad.]

This plant, recently received from the neighborhood of Bogotá, closely matches an old specimen collected by Née (no. 997, in Bot. Mus. Copenh.) in "Peru" according to the label, but presumably from Ecuador (see p. 95). In all essentials both correspond well with the type of the Ecuadorian *M. Ilocnsis*, of which some characteristic fragments have been most kindly supplied to the writer by Prof. L. Diels, Director of the Botanical Garden and Museum at Berlin. The original material, collected in the Lloa Valley by Sodiro seems to have been scarcely in anthesis and the measurements of Prof. Hieronymus must accordingly be in some cases increased to cover the more mature material now available. It is remarkable, that this striking plant, extending as it does from the environs of Bogotá to central Ecuador and perhaps even to Peru, should not have been detected earlier.

Ser. V. GLOBOSAE. Heads sessile or nearly so, in dense hemispherical or globose paniculately disposed glomerules.

KEY TO SPECIES.

Leaves entire, the mature cauline broadly ovate, deeply cordate ..... 31. *M. acutissima.*
Leaves denticulate, oblong-ovate, rounded at base, membranaceous ..... 32. *M. globifera.*
Leaves crenate-serrate, elliptic-ovate, chartaceo-coriaceous ..... 28. *M. multinervia.*

31. **M. acutissima** Rusby (see p. 5). Tall luxuriant twiner, hispid about the nodes; stems round, multicostulate, hollow; leaves of the stem broadly ovate, entire, deeply cordate, cuspidate-acuminate, about 21 cm. long, 14–18 cm. wide, nearly smooth on both sides, slightly paler beneath, 7(–9)-nerved from the base; veins reticulated but immersed; petioles 6–7.5 cm. long, speading-hispid; the rameal leaves much reduced, elliptical, rounded or subcordate at base; thyrse terminal, rather dense, 1–1.8 dm. long, 7–10 cm. thick; heads about 1 cm. long, slender, sessile in hemispherical or subglobose glomerules; bractlets lanceolate, 3.5 mm. long; involucral scales linear-

oblong, obtuse, 7 mm. long, 1.25 mm. wide, 1–2-nerved, somewhat callous at the base, hispidulous toward the tip; corollas white, smooth, 6 mm. long; proper tube 3 mm. long; throat turbinate-subcampanulate, 2 mm. high; teeth ovate, 1.2 mm. long; achenes slender, smooth, brown, about 3 mm. long; pappus-bristles about 37, slightly flesh-tinged, perceptibly thickened upward.—Contrib Gray Herb. n. s. lxiv. 5 (1922).

ANTIOQUIA: thicket on a ridge, Horqueta Mountain, alt. 2288 m., *H. H. Smith*, no. 2613 (N. Y , phot. and fragm. Gr.); Las Nubes, alt 1373 m., *H. H. Smith*, no. 632 (N. Y.).

32. **M. globifera** Rusby. Twining, subherbaceous; stems sometimes as much as 6 m. long or more, terete, fistulose, minutely puberulent at least when young, later subglabrate but more or less papillose-roughened (under lens), somewhat costulate (after drying); internodes at maturity 1 dm. or more in length; leaves ovate, caudate-acuminate, cuspidate-denticulate (teeth 0.5–0.8 mm. high, about 6 mm. apart), rounded at base, membranaceous, 12–19 cm. long, 6–10.5 cm. wide, sparingly granular-puberulent on the upper surface when young, slightly paler beneath, lateral nerves 3 pairs, pinnately disposed and leaving the midnerve within 2 cm. of the base; petioles 3–5 cm. long, rather slender, puberulent when young; inflorescence interrupted, subpyramidal, 2–2.5 dm. long, leafy-bracted; glomerules 12–17-headed, spherical, 1.5–1.8 cm. in diameter, on peduncles 8–12 mm. long; heads 7 mm. long; involucral scales oblong, pale-green, puberulent, unribbed, deltoid at tip, obtusish, callous and whitish at base; corollas white, trumpet-shaped, 5.5 mm. long, moderately and very gradually enlarged upward, without distinction of tube and throat, teeth deltoid, 0.5 mm. long; achenes (immature) 1.5 mm. long, glabrous; pappus-bristles about 36, dull-white.—Rusby in Robinson, Contrib. Gray Herb. lxi. 15 (1920).

MAGDALENA: forest, Minca road, alt. about 366 m., *H. H. Smith*, no. 1986 (N. Y., Gr.). Only one individual seen by the collector.

This species is most closely related to the Guatemalan *M. globosa* Coult. Bot. Gaz. xx. 46 (1895), but that has solid stems, subcoriaceous merely undulate not cuspidate-denticulate leaves, smaller glomerules, and shorter much blunter involucral scales.

DOUBTFUL SPECIES.

M. LIERVALII Herincq. Leaves opposite, cordate, deep-green, velvety, shining, 3 dm. long, 25 cm. wide; the nerves roseate to the middle, white at the tip.—Hort. Franc. 1866, p. 17 (1866).—Intro-

duced into French horticulture from Colombia by Lindige. Not seen, the above characters all that are obtainable from the meagre horticultural description. Very doubtful, even as to the genus.

Species Reduced or Transferred.

M. antioquiensis Hieron. in Engl. Bot. Jahrb. xxviii. 580 (1901) = M. LANUGINOSA DC. (see p. 35).

M. Banisteriae Klatt in Engl. Bot. Jahrb. viii. 36 (1887), not DC. =M. LANUGINOSA DC. (see p. 35).

M. caudata Benth. Pl. Hartw. 201 (1845) =M. RUIZIANA Poepp. (see p. 34).

M. gonoclada DC. Prod. v. 199 (1836) = M. CORDIFOLIA (L. f.) Willd. (see p 41).

M. Karsteniana Klotzsch ex Hieron. in Engl. Bot. Jahrb. xxviii. 581 (1901) = M. LANUGINOSA DC. (see p. 35).

M. orinocensis HBK. Nov. Gen. et Spec. iv. 134 (1820) = M. MICRANTHA HBK. (see p. 42).

M. paczensis Robinson, Proc. Am. Acad. xlvii. 197 (1911). = M. POPAYANENSIS Hieron. (see p. 41).

M. scandens of auth. not (L.) Willd. = M. MICRANTHA HBK. (see p. 42).

M. suaveolens? Benth. Pl. Hartw. 201 (1845), not HBK. = M. MICRANTHA, forma HIRSUTA (Hieron.) Robinson (see p. 43).

M. suaveolens HBK. Nov. Gen. et Spec. iv. 135 (1820) = M. CORDIFOLIA (L. f.) Willd. (see p. 41).

M. vitifolia Hieron. in Engl. Bot. Jahrb. xix. 46 (1894), not DC. = M. PUNCTATA Klatt (see p. 34).

VENEZUELA

The literature relating to the Mikanias of Venezuela is exceedingly slight and consists of the following items.

1820. KUNTH in HBK. Nov. Gen. et Spec. iv. 134 described two species, *M. micrantha* and *M. orinocensis*, from localities within the present limits of Venezuela. These are plants of similar habit and have no convincing technical distinctions. Although one is said to be herbaceous and to have long petioles and the other shrubby with short petioles, careful study of the available material including the type specimens in Paris indicates that they are mere forms of the same species.

1836. DeCandolle, Prod. v. 196, in treating *Mikania,* merely complies the species given by Humboldt, Bonpland, & Kunth, without adding any others from Venezuela.

1881–82. Klatt, Abh. Naturf. Gesellsch. Halle, xv. 325, describes a new species on the basis of a specimen collected at Colonia Tovar by Fendler. Although the plant has subsessile glomerate-paniculate heads, it was given the misleading name *M. racemulosa* and said to be related to the Brazilian *M. ligustrifolia* DC., which has really racemose heads, and to the writer appears rather remote.

1881. Ernst, A., Las Fam. en la Fl. de Venez. 78, mentions under the genus *Mikania, M. orinocensis,* the "guaco blanco," *M. gonoclada,* the "guaco verde," and *M. radicans,* the "guaco morado." While these names are unexplained, it is probably that by the first two he intended the species here called *M. micrantha* HBK. and *M. cordifolia* (L. f.) Willd.; and that the undescribed *M. radicans* of Ernst, a species omitted from the Index Kewensis, was a mere renaming (perhaps unintentional) of *M. parviflora* (Aubl). Karst., a plant that elsewhere has borne the vernacular name "guaco morado," an expression which may be roughtly translated as meaning "mulberry-colored snake-plant."

1886. Ernst, A., Expos. Nac. Venez. 449, mentions similarly *M. gonoclada,* "guaco," *M. scandens,* "guaco blanco," and *M. radicans,* "guaco morado," but without further explanation.

1907. Urban, I., Symb. Ant. v. 224, after characterizing his *M. oopetala* from Cuba, alludes to a nearly related plant collected by Moritz at Colonia Tovar, Venezuela.

1909. Johnston, J. R., Proc. Bost. Soc. Nat. Hist. xxxiv. 267, records the collection on Margarita Island of a *Mikania* identified by him as *M. amara* Willd., but on account of its pedicellate heads and other differences certainly distinct, and here described as *M. Johnstonii.*

1911. Robinson, B. L., Proc. Am. Acad. xlvii. 196, described a new species, *M. hexagona,* on the basis of one of Fendler's plants of Venezuela.

1921. Robinson, B. L., Contrib. Gray Herb. lxi. 15–22, published diagnoses of three further Venezuelan species, namely *M. gracilipes, M. miconiodes,* and *M. vitrea.*

It will thus be seen that not more than three described species of Venezuelan Mikanias have ever been brought together in any one work. However, there appear to be no less than thirteen species

which can now be definitely recorded for the country—a number sufficient to justify keying and revision. How restricted our information is regarding the Mikanias of Venezuela may be inferred from the fact that fully half of those as yet known have been discovered within a few miles of a single centre of exploration, Colonia Tovar, a mountain resort within comparatively easy access of Caracas.

In Venezuela the Mikanias thus far known represent only four of the sectional series, namely the *Spiciformes*, *Racemosae*, *Thyrsigerae*, and *Corymbosae*. For the distinctions between these groups, see key on page 27.

Ser. I. SPICIFORMES DC. (see p. 27).

KEY TO SPECIES.

Leaves triangular, with sharp angles at each side of the base....1. *M. hastata.*
Leaves broadly ovate to elliptic-oblong, rounded on each side of base
  Heads about 8 mm. long; leaves deltoid-ovate, thick, smooth.....2. *M. vitrea.*
  Heads about 5 mm. long; leaves elliptic-oblong, thinly subcoriaceous, slightly puberulent on nerves beneath....4. *M. miconioides.*

1. **M. hastata** (L.) Willd. Climbing soft-wooded shrub; stems subterete, pithy, sparingly puberulent; internodes 4–12 cm. long; leaves triangular, acuminate, broadly cordate, with divergent angles at the sides, more or less crenate-undulate, membranaceous, green on both surfaces, sparingly pubescent chiefly on the nerves beneath, 3-nerved from the short acuminate insertion, 7–11 cm. long, nearly as wide; petiole 4–8 cm. long; panicle large, leafy-bracted, pubescent, of rather dense, subsessile or short-peduncled spikes (6–10 cm. long); heads closely sessile, 5 mm. long; bractlets ovate, acuminate, nearly as long as the involucre, pubescent; involucral scales thin, pale green, substramineous, elliptic-oblong, rounded or mucronate at the somewhat erose-ciliate tip; corollas white, funnel-formed, 2.5 mm. long, sprinkled with sessile glands; achenes 1.3 mm. long, more or less pubescent or granular at least on the angles; pappus-bristles about 20, white, slightly thickened near summit.—Sp. Pl. iii. 1742 (1804); DC. Prod. v. 190 (1836); Urb. Symb. v. 215 (1907). *Eupatorium hastatum* L. Syst. Nat. ed. 10, 1204 (1759). *Willoughbya hastata* (L.) Ktze. Rev. Gen. i. 372 (1891).

ARAGUA: near Colonia Tovar, *Fendler*, no. 1944 (Gr., Mo.).
[Jam., Cuba.]

2. **M. vitrea** Robinson. Stout twining shrub; stems terete,

glabrous, slightly fistulose; leaves round- or deltoid-ovate, shortly caudate-acuminate, subentire, rounded at the sides and rounded or subtruncate at the base, 10–12 cm. long, 7–10 cm. wide; petiole thick, flexuous, subterete, 3–4 cm. long; panicle pyramidal, compound, leafy-bracted, 3 dm. long, 1.5 dm. thick, crisped-puberulent; ultimate branchlets 2–3 cm. long, spreading, densely capituliferous from the middle; heads closely sessile, about 7–8 mm. long; involucral scales oblong, obtusish, slightly puberulent toward the tip, elsewhere glabrous, dark-purple, but pale toward the slightly tumid base; corollas 5 mm. long, somewhat enlarged upward but without distinct throat, the limb purplish and granular-puberulent; pappus sordid-buff.—Contrib. Gray Herb. lxi. 22 (1920).

ARAGUA: near Colonia Tovar, alt. 1983 m., *Fendler*, no. 2349 (Gr., Mo., K.).
[Trinidad, *Britton, Hazen & Mendelson*, no. 1290 (Gr.).]

Ser. II. RACEMOSAE (see p. 30).

3. **M. scabra** DC. Tall twiner or at times a straggling shrub; stems terete, slightly lignescent, somewhat costulate after drying, solid, pithy, scabrous with spreading dark-jointed hairs; internodes 4–20 cm. long; leaves ovate to oblong, 7–10 cm. long, 3.5–8 cm. wide, somewhat serrate to entire, thickish, scabrous-pubescent on both surfaces, pinnately 5-nerved from near the obtuse, rounded, or somewhat cordate base, or definitely feather-veined; petiole rather slender, 6–25 mm. long; panicle ample, of a terminal and 4–10 spreading lateral racemes; these simple or branched toward the base; pedicels filiform, straight, widely spreading, 2–6 mm. long; heads 7–9 mm. long; involucral scales dorsally puberulent, linear, often spreading at tip, all acute or the inner obtusish, 5–6 mm. long; corollas 4.5 mm. long, white; the proper tube somewhat variable in length, usually about 2 mm. long; throat 2–3 mm. long, subcylindric but somewhat enlarged upward; teeth deltoid, granuliferous, 0.6–0.8 mm. long; achenes slender, 3 mm. long, at first sparingly glanduliferous, later nearly smooth, at maturity nigrescent; pappus at first nearly white, in age rufescent.—Prod. v. 190 (1836); Urban, Symb. Ant. v. 218 (1907). *M. racemulosa* Benth. Ann. Nat. Hist. ii. 109 (1839), and in Hook. Jour. Bot. ii. 41 (1840). *M. psilostachya*, vars. *scabra* and *racemulosa* Bak. in Mart. Fl. Bras. vi. pt. 2, 265, 266 (1876). *Willoughbya scabra* (DC.) Ktze. Rev. Gen. i. 372 (1891).

BOLIVAR: very high climber, near stream, vicinity of Ciudad Bolivar, *L. H. & E. Z. Bailey*, no. 1356 (Gr.).
[Brazil, French, Dutch, and British Guiana, Trinidad.]

Although distinguished from *M. psilostachya* chiefly by its pedi-

cellate heads this plant tends to thinner more ovate leaves, and less glandular achenes, and seems to have quite a different range. For the present it appears wise therefore to follow De Candolle, Bentham, and Urban in treating it as a separate species.

Ser. III. THYRSIGERAE (see p. 32).

KEY TO SPECIES.

a. Leaves (*i. e.* mature cauline) rounded at base *b*.
  b. Heads (about 5 mm. long) sessile, more or less distinctly spicate neart he tips of the panicle-branches.....4. *M. miconioides.*
  b. Heads (at full maturity about 7 mm. long) on slender pedicels (0.5–4 mm. in length).....5. *M. gracilipes.*
  b. Heads (8–9 mm. long) subsessile, glomerate by 3–5 at tips of panicle-branches.....6. *M. racemulosa.*
a. Leaves (at least the mature cauline) distinctly cordate *c*.
  c. Leaves with a divaricate acute or acuminate angle on each side, green and only sparingly pubescent beneath.....7. *M. punctata.*
  c. Leaves ovate, entire, rounded at sides, densely canescent-tomentose beneath.....8. *M. lanuginosa.*

4. **M. miconioides** Robinson. Leaves elliptic-oblong, rounded at base, with reticulated veinlets slightly raised on the upper surfaces; heads sessile.—Contrib. Gray Herb. lxi. 19 (1920). For fuller description see p. 37.

ARAGUA: near Colonia Tovar, alt. 1525 m., *Fendler*, no. 2558 (Gr.); also from the same locality, *Moritz*, no. 1656 (sk. and slight fragments in Gray Herb. from Klatt herb.)

[Colomb.]

5. **M. gracilipes** Robinson. Apparently twining; stem slender, round, costulate-sulcate after drying, strigose-setulose particularly near the nodes; leaves ovate, narrowed to an obtusish apex, undulate, rounded at base, with or without a short spreading bluntish lobe or angle at each side, firmly membranaceous, green and glabrous on both surfaces, 9–13 cm. long, 5–9 cm. wide, somewhat 5-nerved; nerves connected by transverse more or less netted veins; these slightly prominulent on both surfaces; petiole 1.5 cm. long; panicle pyramidal, 3 dm. long, 2 dm. thick, leafy-bracted, at length rather lax; the axes covered with a fine incurved puberulence or somewhat tawny-setulose or -strigose; pedicels filiform, at maturity 3–5 mm. long; heads about 7 mm. long; involucral scales narrowly oblong, rounded at the tip, slightly striate on the back, at first pale green to stramineous, at length brownish; corollas white, 3 mm. long, the proper tube slender, 1.5 mm. long, throat campanulate-subcylindric, about 1 mm. high,

teeth ovate, scarcely over 0.5 mm. long; achenes slender, slightly hispid toward the summit, elsewhere glabrous, 3.5 mm. long; pappus-bristles about 30, slightly fulvous in age.—Contrib. Gray Herb. lxi. 15 (1920).

CARABOBO (?): between Valencia and Campanero, alt. 915 m., *Fendler*, no. 2348 (Gr., Mo.).

6. **M. racemulosa** Klatt. Shrubby twiner: stems slender, subterete, scabrid, somewhat setulose especially about the nodes, solid, with yellowish-white pith; internodes 3–7 cm. long; leaves lance-oblong, acuminate, obscurely undulate-denticulate, 7–10 cm. long, 2.3–4.3 cm. wide, pinnately veined, green on both surfaces, nearly or quite glabrous above, bearing a few rather long and subappressed bristles on the midnerve and chief veins beneath; petiole 1 cm. long, canaliculate above, setulose; panicle compound, 3 dm. long or more, 2–2.5 dm. thick, leafy-bracted, the divisions thyrsoid, terminating opposite or alternate branches, 6–10 cm. in length, dense; bractlets ovate, subacute, somewhat pubescent or at least ciliate, about half as long as the involucre; involucral scales oblong, rounded at the tip, substramineous, puberulent; heads about 1 cm. long; corollas white; the proper tube 2 mm. long; throat campanulate-subcylindric, of equal length; teeth ovate, 1 mm. long; achenes 3.5 mm. long, the faces olivaceous and somewhat lucid, the angles rib-like, pale, smooth; pappus-bristles about 35, whitish, barbellate, slightly thickened toward the apex.—Abh. Naturf. Gesellsch. Halle, xv. 325 (1882), in advance reprint, p. 5 (1881).

ARAGUA: near Colonia Tovar, alt. 2135 m., *Fendler*, no. 625 (Gr., Mo.).

Ineptly named; there is little in the thyrsoid-panicle of this species to suggest a raceme.

7. **M. punctata** Klatt. Leaves thin, triangular-ovate, green on both surfaces, the lateral angles rather sharp and basal sinus deep but open.—For further characters see p. 33.

FEDERAL DIST.: Caracas, *Birschel* (Gr.).
[Colomb., Cent.-Am., S. Mex.]

8. **M. lanuginosa** DC. Leaves triangular-ovate, rounded at the sides, densely gray-tomentose on both surfaces.—For further characters see p. 35.

ARAGUA: Colonia Tovar, *Moritz*, no. 1657 (sk. and fragm. in Gray Herb. ex hb. Klatt); near Colonia Tovar, alt. 1708 m., *Fendler*, no. 630 (Gr., Mo.).
[Colomb.]

Ser. IV. CORYMBOSAE (see p. 39).

KEY TO SPECIES.

a. Leaves clearly cordate or hastate *b.*
  b. Stems 6-angled; heads relatively large; involucral scales (when fully mature) 9–10 mm. long.....9. *M. cordifolia.*
  b. Stems terete, multicostulate (when dried); involucral scales 3–5 mm. long.....10. *M. micrantha.*
a. Leaves ovate-oblong to suborbicular, rounded or pointed at base *c.*
  c. Stems when young slightly 6-angled, when mature terete or nearly so; bracts (not bractlets) petiolate *d.*
    d. Leaves more or less evidently 3(–5)-nerved somewhat above the base; involucral scales not gibbous or calcarate at base..11. *M. Johnstonii.*
    d. Leaves pinnately veined; scales shortly but distinctly calcarate at base.....12. *M. trinitaria.*
  c. Stems even in age strongly and sharply 6-angled, the angles narrowly winged; bracts sessile.....13. *M. hexagona.*

9. **M. cordifolia** (L. f.) Willd. Sp. Pl. iii. 1746 (1804). *Cacalia cordifolia* L. f. Suppl. 351 (1781). Stems hexagonal; leaves round-ovate, acute or acuminate, cordate by an open sinus. For further characters see p. 41.

FEDERAL DISTRICT and ARAGUA: mountains near Caracas and Colonia Tovar alt. 1525-2135 m., *Fendler*, no. 627 (Gr.); Caracas and vicinity, *L. H. & E. Z. Bailey*, no. 777 (Gr.); toward La Guaira *L. H. & E. Z. Bailey*, no. 1178 (Gr).

[Widely distrib. and rather common in trop. and subtrop. Am.].

This is probably the species which Ernst, Las Fam. en la Fl. de Venez. 78 (1881) and Expos. Nac. Venez. 449 (1886), mentions as *M. gonoclada* and calls by the names *Guaco* and *Guaco verdo*.

10. **M. micrantha** HBK. Nov. Gen. et Spec. iv. 134 (1820). Stem terete or nearly so; leaves ovate, acuminate, sagittate-cordate or subhastate at base, with a deep but open sinus; heads small. For further description see p. 41.

FEDERAL DIST.: Caracas, *Birschel* (Gr.).

ARAGUA: a few miles southeast of Colonia Tovar, alt. 1220 m., *Fendler*, no. 628 (Gr., Mo.).

MONAGAS: Caripe, in shade, *Humboldt & Bonpland*, no. 235 (Par., phot. Gr.).

STATE NOT IDENTIFIED: Island of Pararumo in the Orinoco, *Humboldt & Bonpland* (Par., phot. Gr.), the type of *M. orinocensis* HBK.

[Widely distrib. in trop. and subtrop. Am.]

11. **M. Johnstonii** Robinson (see p. 14). Shrubby twiner; branchlets hexagonal and puberulent, the angles rib-like; stems at maturity terete, brown, glabrous, shining, internodes 1–2.6 dm. long, fistulose; leaves round-ovate, shortly pointed to rather sharply acuminate, obscurely undulate to entire, revolute on the margin, rounded to (especially the upper) slightly and rather abruptly pointed

at the base, 5–11 cm. or more in length, 3.5–7 cm. in breadth, subcoriaceous, triply-nerved from well above the base, above glabrous and lucidulous but somewhat bullate, beneath covered with a very short close olivaceous tomentum except upon the lighter-colored nearly glabrous midrib and chief veins; petioles 2–4 cm. long, their bases transversely connected around the tumid node by an elevated stipular line; compound corymbs rather loose, trichotomous; pedicels 2–5 mm. long; heads 1 cm. long, closely subtended by a spatulate-oblanceolate somewhat petiolate bractlet about 5 mm. in length; corollas about 6.5 mm. long, glabrous; the proper tube slender, uniformly cylindric, 2 mm. long; the throat short, scarcely 1 mm. in length, abruptly expanded; teeth lanceolate, acutish, 3.5 mm. long; achenes slender, tapering to the base, grayish-brown, obscurely sprinkled with a few sessile and stalked glands, 5 mm. long; pappus-bristles about 65, white or flesh-colored.—*M. amara* J. R. Johnston, Proc. Bost. Soc. Nat. Hist. xxxiv. 267 (1909), not Willd.

MARGARITA ISLAND: en route from El Valle to Juan Griego, Aug. 12–15, 1903, *J. R. Johnston*, no. 104 (Gr.).

12. **M. trinitaria** DC. Vigorous twiner (though sometimes subprostrate); stem when young perceptibly 6-angled, scabrid-puberulent, in age subterete, smoothish, fistulose; internodes sometimes as much as 18 cm. long; branches opposite, curved-ascending; leaves subobolong-ovate, acuminate, entire, barely acute to subacuminate at base, 9–10 cm. long, half as wide, firmly membranaceous or subcoriaceous, above green, glabrous, and at length somewhat bullate, beneath covered especially between the veinlets with a very short sometimes merely microscopic gray or olivaceous tomentum; midrib somewhat 2–4-furrowed; chief lateral veins in about 4–5 pairs; petioles slender, not winged, channelled above, scabrid-puberulent, about 1.8 cm. long, flexuous as if inclined to twine; corymbs on short leafy branches, round-topped, moderately dense; bracts lanceolate, petiolate; heads sessile in 3's, about 1 cm. long; bractlets linear, about 3 mm. long; involucral scales oblong, erose at the rounded tip, slightly narrowed and dorsally somewhat gibbous or subcalcarate at base, about 8.5 mm. long, 2 mm. wide, dorsally purplish-puberulent; corollas greenish-white; the proper tube 3.2 mm. long; the throat turbinate, scarcely 1 mm. long; teeth lance-oblong, 2.4 mm. in length; achenes very immature; pappus-bristles about 56, buff (in age).—Prod. v. 194 (1836); Pulle, Enum. Pl. Surinam, 459 (1906).

ARAGUA: Colonia Tovar, alt. 1982 m., *Fendler*, no. 2350 (Gr., K., Mo.).
ANZOATEGUI: on Rio La Peña, *L. H. & E. Z. Bailey*, no. 1683 (Gr.).
[Trinidad, Dutch Guiana acc. to Pulle, l. c.]

Urban, Symb. Ant. v. 228 (1907) refers this species with mark of affirmation to the synonymy of *M. latifolia* J. E. Sm., but this would certainly give the latter species an unduly wide interpretation. To the writer it appears that these plants are pretty readily distinguished by the following characters: *M. trinitaria* has oblong-ovate subcoriaceous leaves, which are pinnately veined, acute at the base, and rather densely and conspicuously tomentellous beneath, while the involucral scales are gibbous-subcalcarate at the base. In *M. latifolia*, on the other hand, the leaves are thinner, more broadly ovate, rather blunt at base, nearly smooth or at most puberulent, and pinnately 5-nerved rather than pinnately veined; and the involucral scales are not at all or but very slightly gibbous at base.

13. **M. hexagona** Robinson. Stout twiner; stem sharply 6-angled, becoming 1.2 cm. or more in thickness, twisted, fistulose, at first puberulent, soon essentially glabrous, purplish-brown; the angles narrowly winged and at length somewhat corky; leaves ovate, acuminate, entire, rounded at base and somewhat decurrent upon the petiole, 5(–7)-nerved from above the base, 1 dm. long, 7 cm. wide, green and rough-puberulent on both surfaces; petiole about 2.5 cm. long; the upper (bracteal) leaves ovate, sessile or nearly so; corymb compound, rounded, 2 dm. in diameter; bractlets lanceolate, herbaceous, acute, often about as long as the involucres; heads about 1 cm. long, borne singly on pedicels 3–5 mm. in length; involucral scales narrowly lance-oblong, acuminate, pale-green, substramineous, nearly smooth; corollas about 5 mm. long; the proper tube 2.5 mm. long; throat campanulate, scarcely 1 mm. long; teeth oblong, about 2 mm. in length; achenes 4 mm. long; pappus-bristles about 70, rufescent.—**Proc. Am. Acad. xlvii. 196 (1911).**

ARAGUA: near Colonia Tovar, alt. 1700 m., *Fendler*, no. 626 (Gr.).

REDUCED, DOUBTFUL, OR EXCLUDED SPECIES.

M. amara J. R. Johnston, Proc. Bost. Soc. Nat. Hist. xxxiv. 267 (1909), not Willd. = M. JOHNSTONII Robinson (p. 57).

M. gonoclada DC. Prod. v. 199 (1836); and (?) Ernst, Fam. Fl. Venez. 78 (1881), & Expos. Nac. Venez. 449 (1886) = M. CORDIFOLIA (L. f.) Willd. (p. 57).

M. orinocensis HBK. Nov. Gen. et Spec. iv. 134 (1820) does not appear separable from M. MICRANTHA HBK. l. c.

M. PARVIFLORA (Aubl.) Karst. Deutsche Fl. 1061 (1883), a little known plant of French Guiana has not as yet been demonstrated in Venezuela though its occurrence there is to be expected. It was the original upon which *M. amara* (Vahl) Willd. was later founded, the species to which *M. guaco* HBK. was reduced by Baker as a variety. However, it is certainly distinct, having thicker leaves, much shorter petioles, and corolla-teeth about 3 mm. long, slightly exceeding the throat, instead of less than 1 mm. long and much shorter than the throat as in *M. guaco*.

M. radicans Ernst, Fam. Fl. Venez. 78 (1881), & Expos. Nac. Venez. 449 (1886), is an unexplained name quite without diagnosis.

M. scandens of auth. incl. probably Ernst, Expos. Nac. Venez. 449 (1886), not Willd. = *M. micrantha* HBK. Nov. Gen. et Spec. 134 (1820).

ECUADOR.

The significant references to the Mikanias of Ecuador appear to be covered by the following brief bibliography.

1809. HUMBOLDT & BONPLAND, Pl. Aequin. ii. 87, t. 106, recorded and figured from the neighborhood of Gonzanama within the present boundaries of the country *M. angularis*.

1820. HUMBOLDT, BONPLAND, and KUNTH, Nov. Gen. et Spec. iv. 136–9, described as of Ecuador three species as of *Mikania*, namely, *M. Tafallana* (which is closely related to *M. parviflora* (Aubl.) Karst.), *M. loxensis* (which appears to be only a smoothish form of *M. cordifolia* (L. f.) Willd.), and *M. arborea* (now treated as *Eupatorium dendroides* Spreng., see Proc. Am. Acad. liv. 359, lv. 11).

1845. BENTHAM, Pl. Hartw. 211, added an Ecuadorian species to the genus.

1866. JAMESON, Syn. Pl. Aeq. ii. 90–92, compiles descriptions of *M. loxensis*, *M. Tafallana*, and *M. corymbulosa*, but adds nothing from personal observation.

1894. HIERONYMUS in Engl. Bot. Jahrb. xix. 47, founds on Ecuadorian plants of Lehmann a new species and a new variety of *Mikania*.

1900. HIERONYMUS, l.c. xxix. 15–18, contributing an annotated enumeration of the *Compositae* to a paper on the Ecuadorian collections of Prof. Sodiro, lists eight species of *Mikania*, of which four are described as new to science.

1901. Hieronymus, l. c. xxviii. 576–582, in further notes on the Andean *Compositae* of Lehmann and others, describes three more species of *Mikania* from Ecuador.

1921. Robinson, B. L., Contrib. Gray Herb. lxi. 12–21, published diagnoses of the following species occurring in Ecuador: *M. Andrei*, *M. Jamesonii*, and *M. Seemannii*.

Ecuadorian material of this genus in North American herbaria is disappointingly slight. The present treatment must accordingly be of a frankly sketchy nature and largely the result of compilation. However, it seems worth while at least to bring together and present in convenient form the hitherto scattered and wholly uncorrelated information available regarding the species thus far recorded from Ecuador.

Ser. I. Spiciformes DC. (see p. 27).

Key to Species.

a. Leaves rounded at base *b*.
  b. Involucral scales 4–4.5 mm. long; spikes panicled....1. *M. leiostachya*.
  b. Involucral scales 2.5 mm. long; spikes conglomerate....2. *M. chagalensis*.
a. Leaves cordate *c*.
  c. Herbaceous; leaves membranaceous, obtusish; outer involucral scales glandular on the back; proper tube of corolla scarcely 1 mm. long.....3. *M. cuencana*.
  c. Shrubby; leaves subchartaceous, cuspidate-acuminate; involucral scales (ciliate) glabrous on the back; proper tube of the corolla 1.75 mm. long.....4. *M. Eggersii*.

1. **M. leiostachya** Benth. Pl. Hartw. 201 (1845). Leaves ovate, essentially entire, rounded at base, subcoriaceous, reticulated on both surfaces; heads sessile, about 7 mm. long. For further characters see p. 29.

Pichincha: near Quito, *Jameson* (Gr.).
[Colomb., Panama, Cent. Am.]

In Ecuador this species appears to vary as follows:

Forma α. **typica** (see p. 15). Rather obscurely puberulent or nearly smooth. Lit., range, and exsicc. as above.

Forma β. **irrasa** Robinson (see p. 15). Stems, petioles, and particularly the axis and branches of the inflorescence fulvous-tomentose.—? *M. Sodiroi* Hieron. in Engl. Bot. Jahrb. xxix. 16 (1900).

Tungurahua: Cusatagua, vicinity of Ambato, *Prof. A. Pachano*, no. 201 (U. S.).

No material of *M. Sodiroi* has been seen by the writer and it is

quite possible that it may have distinctions much more definite than any brought out in the original diagnosis.

2. **M. chagalensis** Hieron. Half-shrubby twiner, with stems reaching 8 m.; branches round, as much as 2.5 mm. thick, striate, at length glabrescent; leaves ovate-oblong, acuminate, entire or remotely and inconspicuously callous-denticulate, rounded and somewhat unsymmetrical at base, slightly puberulent or glabrescent on both surfaces, pinnately somewhat 5-nerved, the nerves subalternate, extending the greater part of the length and connected by subparallel cross-veins; spikes many, conglomerate, the glomerules opposite, long-stalked, the speading and pubescent peduncles often bearing a simple reflexed and stalked spike at the base; terminal panicle about 2 dm. long; bractlets linear, 1–1.5 mm. long; heads sessile; involucral scales lingulate, 2.5 mm. long, 0.75 mm. wide, ciliate at tip, fuscescent on the back but paler toward the edge; corollas greenish-white, about 1.75 mm. long; throat narrowly funnel-formed, twice as long as the proper tube; teeth linear-subulate; achenes glabrous, 1.5 mm. long; pappus-bristles about 35, slightly reddish.—Hieron. in Engl. Bot. Jahrb. xix. 47 (1894).

Not seen; the description here condensed from the original diagnosis.

CUENCA: in open bushy places on middle western slopes of the western Andes near Chagal, alt. 2000–2500 m., *Lehmann*, no. 4887.

3. **M. cuencana** Hieron. Subscandent herb; stems round, obsoletely striate, soon glabrate, pithy, sometimes as much as 10 m. long, with internodes 9 cm. in length; leaves ovate, obtusish, entire, shortly cuneate in the middle of a broadly cordate base, somewhat 5–7-nerved, net-veined between the nerves, the veins perceptibly exserted beneath, scarcely so above; petiole compressed, soon glabrate, sometimes as much as 5 cm. long; inflorescence spicate-racemose, the lateral partial ones from the upper axils and equalling the subtending leaves; bracts 1–1.5 cm. long; lateral spikes as much as 4 cm. and the terminal 5 cm. long, villous-pubescent; bractlets ovate, about 1 mm. long; heads sessile; involucral scales oblong, obtuse, 3–3.25 mm. long, 1.25–1.5 mm. wide, 3–5-nerved, dark-strawcolored, scarious, tufted at tip, ciliate, the outer glandular on the back; corollas greenish-white, 2.5 mm. long; proper tube scarcely 1 mm. long; throat 1.5 mm. including the teeth (0.75 mm. in length and dorsally papillose at tip); achenes smooth; pappus-bristles 30–35, yellowish-white, thickened toward the apex.—Hieron. in Engl. Bot. Jahrb. xxviii. 581 (1901).

CUENCA: on very wet slopes of the lower western Andes, alt. 1000–1800 m., *Lehmann*, no. 5586.

Not seen; description here condensed from the original diagnosis.

4. **M. Eggersii** Hieron. High climbing shrub; stem subterete, costulate, pithy but sometimes fistulose, covered with a dark brownish spreading pubescence; internodes becoming 12 cm. or more in length; leaves ovate, cuspidate-acuminate, entire, shallowly and often unsymmetrically cordate, subchartaceous, green on both surfaces, above glabrous or nearly so and somewhat lucid, beneath dull, finely pubescent, 12–17 cm. long, 9–12.5 cm. wide; lateral veins nerve-like, pinnately disposed in 3 pairs, curved-ascending, copiously connected by reticulated cross-veins; veinlets prominulent on both surfaces; petiole 2–2.8 cm. long, spreading-pubescent; panicle large, opposite-branched; bracts ovate, foliaceous, 1–3.5 cm. long; branches naked nearly to the middle; spikes mostly 5–13 on each branch, widely spreading, 2.5–5.5 cm. long; bractlets lance-linear, attenuate, 1–3 mm. long; heads sessile, about 5 mm. long; involucral scales brownish-stramineous, oblong, 3-nerved, ciliolate, obtuse, about 3.5 mm. long; corollas white, smooth, about 3 mm. long; teeth lanceolate, sharp, 0.6 mm. long; achenes dark-brown, smooth; pappus-bristles 35–40, white turning to pale salmon, slightly thickened upward.—Hieron. in Engl. Bot. Jahrb. xxviii. 582 (1901).

Guayas: in woods near Balao, *Eggers*, no. 14,697 (Arn. Arb.).

Subject to a gall or teratological condition in which the achenes are much elongated into flask-shaped bodies tipped with very short pappus and still more rudimentary (nearly polypetalous) corolla.

Ser. II. Thyrsigerae (see p. 32).

Key to Species.

a. Leaves pointed or rounded at base *b*.
  b. Petioles 5–7 mm. long; leaves narrowly lanceolate....5. *M. lanceolata*.
  b. Petioles 1.5–4 cm. long; leaves ovate c.
    c. Heads sessile; leaves coarsely few-toothed.....6. *M. Jamesonii*.
    c. Heads pedicelled; leaves entire.....7. *M. pichinchensis*.
a. Leaves (at least the cauline) cordate-ovate, with rounded basal lobes *c*.
  c. Panicle open, pyramidal, its divisions not at all spiciform *d*.
    d. Leaves somewhat tawny-villous beneath, the basal sinus of the cauline narrow, acute; bractlets elliptic-ovate, nearly equalling the involucral scales.....8. *M. Ruiziana*.
    d. Leaves white-tomentellous beneath, the basal sinus open, rounded; bractlets lance-linear, much narrower and shorter than the involucral scales 9. *M. Holwayana*.

c. Panicle dense, thyrsoid; its ultimate subdivisions sub-cylindric and somewhat spiciform.....10. *M. Haenkeana.*
a. Leaves deltoid-cordate; basal lobes acute, divaricate....11. *M. angularis.*

5. **M. lanceolata** Hieron. Climbing shrub; stems round or nearly so, glaucous-green or slightly purplish, at first minutely powdery-puberulent, later glabrate; internodes 3–6 cm. long; leaves narrowly lanceolate, long-acuminate, rounded or shortly cuneate at base, subcoriaceous, 8–12 cm. long, 1–1.5 cm. wide, glabrous and glaucous on both surfaces, above clearly and beneath obsoletely glandular-foveolate, pinnately veined, the chief veins 5–6 on each side; veinlets reticulated, prominulent beneath, immersed above; inflorescence thyrsoid-paniculate, divaricately branched; heads sessile, in glomerules of 3–5 at the tips of the branchlets; involucral scales spatulate, obtuse, 3 mm. long, scarious, dark-stramineous, ciliolate, glandular-puberulent on the back; corollas puberulent, 3.5–4 mm. long; the proper tube 1–1.5 mm. long; the enlarged throat about 2 mm. long, and the teeth 0.5 mm. long; nearly mature achenes 2 mm. long, dark, with narrow scabrid straw-colored ribs; pappus-bristles 25–30, yellowish-white.—Hieron. in Engl. Bot. Jahrb. xxix. 17 (1900).

PICHINCHA: in woods of temperate region near Niebli, *Sodiro*, no. 7/1. [Peru.]

Not seen; description compiled. Species said by Prof. Hieronymus to be most nearly related to the Bolivian *M. longiacuminata* Rusby, but to differ in the nature of its pubescence.

6. **M. Jamesonii** Robinson. Slender, nearly smooth up to the inflorescence, probably a subherbaceous twiner; stems terete, multicostulate (after drying), smooth, brown, pithy, about 3 mm. thick; internodes as much as 1.5 dm. long; leaves ovate, rather abruptly caudate-acuminate, 5–6-toothed on each side, obtusely pointed to subacute at base, 7–9 cm. long, 5–7 cm. wide, submembranaceous, green and glabrous on both surfaces, with 3 pairs of lateral veins pinnately disposed, the first intramarginal, the second 6–7 mm. and the third 1.5 cm. above the base; veins immersed above, exserted beneath, loosely reticulated; teeth 2–4 mm. high, 1 cm. or more apart, salient, tipped with a divaricate cusp; panicles ovoid-pyramidal, terminal and in the upper axils, pedunculate, 1–2 dm. high and thick, covered with a tawny incurved puberulence; branches widely spreading; heads sessile in 3's at the tips of the branchlets and in pairs slightly below; bracteoles minute, lanceolate, 1–1.5 mm. long; involucral scales linear-oblong, somewhat narrowed to an obtusish tip,

ciliolate, dorsally brownish, nearly smooth, scarcely nerved, 5 mm. long; corollas smooth; proper tube slender, 1.5 mm. long; expanded throat campanulate-subcylindric, of equal length; teeth 0.7 mm. long; achenes slender, smooth or nearly so, 4 mm. long; pappus-bristles 30–35, scarcely thickened toward the tip, slightly tawny at least in age.—Contrib. Gray Herb. lxi. 17 (1920).

PICHINCHA: forest on the western side of Mt. Pichincha, *Jameson*, no. 833 (K., phot. and fragm. Gr.).

A characteristic species, the leaves with their few coarse spreading and cuspidate teeth being quite unlike those of the other species having sessile paniculate heads.

7. **M. pinchinchensis** Hieron. Twining; branches flattened, striate, covered with dark glandular pubescence; internodes 5–10 cm. long; leaves ovate, shortly acuminate, entire, membranaceous, above sparingly and beneath more densely puberulent on the nerves, pinnately 5-nerved and reticulate-veined, attaining 7 cm. in length and 4.5 cm. in width, the pairs of nerves leaving the midrib about 5 and 15 mm. above the base and nearly reaching the tip; panicle glandular-puberulent, many-headed; pedicels 2–6 mm. long, slender, glandular-pubescent, the subtending bractlets lanceolate, about 2 mm. long, glandular-ciliate; heads inclined to nod; involucral scales spatulate, obtuse, about 4 mm. long, dusky green, glabrous; corollas (undeveloped) about 3 mm. long; the proper tube about equalling the perceptibly enlarged throat and limb; pappus-bristles 35–40, blush-whitish.—Hieron. in Engl. Bot. Jahrb. xxviii. 576 (1901).

PICHINCHA: on western slopes of Mt. Pichincha, near Lloa, *Sodiro*, no. 7, 4.

Not seen; the character here condensed from the original of Prof. Hieronymus.

8. **M. Ruiziana** Poepp. in Poepp. & Endl. Nov. Gen. et Spec. iii. 53 (1845). Leaves bright green, ovate, caudate-attenuate, cordate by a narrow sinus. **For further characters see p. 34.**

PICHINCHA: in subtropical forests along the Pilaton River, *Sodiro*, no. 7, 2, according to Hieronymus in Engl. Bot. Jahrb. xxix. 17 (1900); without locality but presumably in the Province of Pichincha, *Jameson* (U. S.).

[Peru, Colomb.]

9. **M. Holwayana** Robinson (p. 11). Stems subterete, fistulose, puberulent, at length glabrate; leaves broadly ovate, shortly acuminate, cuspidate-denticulate or shallowly sinuate, cordate with an open sinus, membranaceous, above green, puberulent especially on the nerves, beneath whitish-tomentellous with some tinge or mottling

of purple at least when young, 7–16 cm. long, 5–14 cm. wide; nerves purplish-brown, 3(–5) from the very base or the main lateral leaving the midnerve as much as 10–12 mm. above a smaller essentially basal pair; petioles 2–3 cm. long, dark brown slightly puberulent; panicles large, 4–5 dm. long, 3–4 dm. thick, rather loose, leafy-bracted, the main divisions pedunculate, pyramidal, the ultimate branches not racemiform; pedicels 1.5–3 mm. long, bracteolate at or near the top; bracteoles subherbaceous, lance-linear, acute, 4 mm. long; heads about 1 cm. long; involucral scales obovate-elliptical, obtuse to rounded at tip, purple-tinged, obscurely puberulent, ciliolate, 6.5 mm. long; corollas white, glabrous, with cylindric proper tube 3.5 mm. long, almost no throat, and ovate acutish spreading teeth about 2.2 mm. in length; immature achenes glabrous, 3.5 mm. long; pappus-bristles about 50, white, delicately capillary, not thickened upward.—Contrib. Gray Herb. lxiv. 11 (1922).

CHIMBORAZO: Huigra, 5 Aug. 1920, *Prof. & Mrs. E. W. D. Holway* (Gr., N. Y., U. S.).

10. **M. Haenkeana** DC. Slender herbaceous twiner; stem glabrous; internodes sometimes as much as 17 cm. in length; petioles slender, 3–3.4 cm. long; leaves ovate, caudate-acuminate, subentire, shallowly cordate with narrow sinus and broad rounded basal lobes, membranaceous, above glabrous, beneath subtomentose, about 6.8–7.5 cm. long, 4–5 cm. wide; panicle-divisions pedunculate in the upper axils, ascending, dense, thyrsoid; heads congested; involucral scales very minutely puberulent; achenes glabrous.—Prod. v. 196 (1836); Hieron. in Engl. Bot. Jahrb. xxix. 17 (1900).

PICHINCHA: tropical and subtropical region by the Toachi River, *Sodiro*, no. 7/6, acc. to Hieron. l. c. "ex descriptione."
[Peru, Bolivia.]

It may be remarked that the type-material from Peru, now in the DeCandollean Herbarium at Geneva, shows leaves more nearly entire and more narrowly caudate-acuminate than would be inferred from the description; also that although the branchlets of the panicles were originally characterized as subspiciform, the congested and thyrsoidal nature of the inflorescence is such that the species appears better placed here among the *Thyrsigerae* than in Ser. *Spiciformes*.

11. **M. angularis** H. & B. Pl. Aeq. ii. 87, t. 106 (1809). Smoothish; leaves triangular-hastate. For further characters see p. 33.

LOJA: near the village of Gonzanama, *Humboldt & Bonpland*, no. 3434 (Par., poor phot. Gr.).
[Colomb., Peru., and acc. to Baker Dutch Guiana.]

Ser. III. Corymbosae (see p. 39).

Key to Species.

a. Leaves ovate, cordate or subcordate *b.*
  b. Heads small; involucral scales 2.5–4.5 mm. long; stems subterete, sulcate-costulate. . . . . 12. *M. micrantha.*
  b. Heads of medium size; scales 6–9 mm. long; branches strongly hexagonal *c.*
    c. Leaves 2–6 cm. wide, cordate, membranaceous, above very shortly and finely pilose. . . . . 13. *M. cordifolia.*
    c. Leaves very small, 4–10 mm. wide, hastately toothed or lobed at base. . . . . 14. *M. Andrei.*
  b. Heads large (for the genus); involucral scales 8–12 mm. long; branches subterete or but slightly angulate, mostly multicostulate *d.*
    d. Herbaceous; leaves puberulent or sparingly pubescent beneath *e.*
      e. Petioles 3–5 cm. long, obscurely puberulent, connected at base by fimbriated stipular ridges. . . . . 15. *M. chimborazensis.*
      e. Petioles 1.5–2 cm. long, rufous-pubescent, without conspicuous stipular connection. . . . . 16. *M. lloensis.*
    d. Shrubby; leaves rufous-tomentose beneath [At this point may be sought *M. corymbulosa* Benth., which on account of its more numerously angled achenes has been transferred to the genus *Kanimia*.]
a. Leaves broadly ovate to elliptic-ovate, not cordate, rounded to shortly and abruptly pointed at base *f.*
  f. Leaves about 7-nerved from the base, with a few salient teeth; heads pedicelled. . . . . 17. *M. Seemannii.*
  f. Leaves pinnately nerved from somewhat above the base, entire; heads sessile, ternate . . . . . 18. *M. Tafallana.*

12. **M. micrantha** HBK. (see p. 41). *M. scandens* Hieron. in Engl. Bot. Jahrb. xxix. 17 (1900), not (L.) Willd.

Pichincha: in subtropical woods in the Mindo Valley, etc., *Sodiro*, no. 7/5, acc. to Hieron. l. c., as *M. scandens.*
[Widely distrib. in trop. and subtrop. Am.]

Var. **cynanchifolia** (Hook. & Arn.), comb. nov. Stems slender, elongated, velvety; leaves small, cordate-ovate, finely puberulent above, softly gray-tomentellous beneath; inflorencences mostly rather dense as in forma *congesta* (see p. 43); heads small, the bractlets and at least the outer involucral scales tomentellous.—*M. scandens*, var. *cynanchifolia* Bak. in Mart. Fl. Bras. vi. pt. 2, 249 (1876); Hieron. in Engl. Bot. Jahrb. xix. 46 (1894). *M. cynanchifolia* & *M. pubescens* Hook. & Arn. acc. to Bak. l. c.

Guadcas: in bushy places, Balao, *Eggers*, no. 14,336 (Arn. Arb.); in open bushy places on borders of maritime marshes near Naranjal, *Lehmann*, no. 4886 acc. to Hieronymus, l. c., as *M. scandens*, var. *cynanchifolia.*
[S. Braz. and N. Argent.].

13. **M. cordifolia** (L. f.) Willd. (see p. 41); Hieron. in Engl. Bot. Jahrb. xxix. 15 (1900). ? *M. loxensis* HBK. Nov. Gen. et

Spec. iv. 136 (1820); DC. Prod. v. 196 (1836); Jameson, Pl. Aeq. ii. 90 (1866).

PICHINCHA: in subtropical woods, San Nicolas, *Sodiro*, no. 7/9, acc. to Hieron. l. c.

CHIMBORAZO: near Huigra, *J. N. & G. Rose*, no. 22,161 (Gr., N. Y.), an unusually pubescent, indeed, tomentellous form probably corresponding to the plant of northern Paraguay described as var. TOMENTOSA by Hieronymus in Engl. Bot. Jahrb. xxii. 793 (1897). It is to be remembered, however, that even the type of the species exhibits considerable pubescence.

? LOJA: between Alto de Pulla and Loja, *Humboldt & Bonpland* (type of *M. loxensis*, Par., phot. Gr.), a smoothish form probably of this species.

PROV. NOT ASCERTAINED: Sabiango, alt. 915 m., a vine with whitish flowers, *Townsend*, no. 929 (U. S., Field Mus.), one of the more pubscent forms, also probably referable to the formal var. TOMENTOSA Hieron.

14. **M. Andrei** Robinson. Slender and presumably herbaceous twiner; stem strongly 4(–6)-angled, brown, glabrate, scarcely over 1 mm. in thickness; leaves ovate, blunt or abruptly pointed at tip, cordate or subtruncate at base, hastately 1(–3)-toothed or -lobed on each side, 3-nerved from the base, above scarcely hirtellous, beneath slightly paler, nearly smooth, punctate, 7–14 mm. long, 4–10 mm. wide; petioles slender, 6–9 mm. long, crisped-puberulent; corymbs terminal, dense, convex, 3 cm. or more in diameter; bracts ovate-elliptic, herbaceous; bractlets similar, narrower, obtuse, a third shorter than the involucre; involucral scales lance-linear, 8–9 mm. long, narrowed to an obtusish or rounded and ciliolate tip, also somewhat narrowed toward the callous-tumid base, nearly glabrous, with a yellowish tinge; corollas (very immature) about 6 mm. long, glabrous; proper tube 2.5 mm. long, the throat of similar length, but the teeth only 0.8 mm. long; achenes subglabrous; pappus-bristles 80–90, not thickened at tip, yellowish-flesh-colored.—Contrib. Gray Herb. lxi. 12 (1920).

LOJA: at Zamora, alt. about 3000 m., *André*, no. 4528 (Gr.).

Nearly related to the Peruvian *M. brachyphylla* Hieron., but readily distinguished from its Ecuadorian congeners by its very small leaves.

15. **M. chimborazensis** Hieron. Herbaceous or somewhat shrubby; stems weak, climbing, subterete, striate-sulcate, soon glabrate and fistulose; internodes 8–15 cm. long; petioles (of mature cauline leaves) 3–5 cm. long, obscurely puberulent, the pairs connected at base by a transverse somewhat arched stipular band fimbriate on the upper edge; leaf-blades rather broadly ovate, shortly acuminate, mucronate at tip, the cauline sinuate-dentate, with broad open sinus at base and short acumination at point of attachment, membranaceous, 7–10 cm. long, 6–8 cm. wide, 7-nerved from the very

base, subappressed-puberulent and scabrid above, sparingly and more softly appressed-pubescent at least on the nerves beneath; corymbs terminal, compound, 3-parted, only moderately convex, 7–10 cm. or more wide, their branchlets and pedicels (2–4 mm. long) granular-puberulent; involucral scales oblong, obtusish or subacute, 8–10 mm. long, deep-purple toward the ciliate tip, dorsally puberulent; corollas about 7 mm. long, the proper tube pale, yellowish, the narrowly turbinate throat purple, the teeth about 1 mm. long; achenes slender, glabrous, grayish-olivaceous with paler ribs, about 5 mm. long; pappus-bristles exceedingly numerous (about 100), scabrid, fulvous.—Hieron. in Engl. Bot. Jahrb. xxix. 15 (1900).

CHIMBORAZO: at high altitude, *Cross*, nos. 13 (K.) and 67 (Gr.); in forests at base of Mt. Chimborazo, *Sodiro*, no. 7/7, acc. to Hieron. l. c.

PICHINCHA: shrub in thickets, alt. 3100 m., *Hall* (K.).

16. **M. lloensis** Hieron. (see p. 48).

PICHINCHA: on the western slopes of Mt. Pichincha in the Lloa Valley, *Sodiro*, no. 7/8 (Brl., fragm. Gr.).

[Colombia.]

17. **M. Seemannii** Robinson. Probably twining and subherbaceous; stem when young hexagonal and muriculate-scabrous, later subterete, nearly smooth, yellowish-brown; internodes 1–5 cm. long, rougher and more angulate toward the summit; leaves broadly ovate, acuminate, dentate to undulate (the teeth 10–15 mm. apart, the lower commonly sharp and salient, the others mere undulations of the margin), rounded or somewhat pointed at the base, firmly coriaceous, 7-nerved from the base, above sharply scabrous (from the thickened bases of the persistent trichomes), lucid, beneath dull, slightly paler, scabrid, loosely reticulated, 5–8 cm. long, 3.5–5 cm. wide; petioles 1–1.4 cm. long, hispidulo-puberulent; corymbs terminal, ovoid, rather dense, about 7 cm. high and thick; pedicels 2–4 mm. long, puberulent; bracteoles rhombic-ovate, acute, borne at the summit of the pedicel; heads 1 cm. long; involucral scales almost veinless, oblong, 7–9 mm. in length, the inner slightly puberulent, thin, ciliated, stramineo-olivaceous, the outer firmer, dark-brown, hispidulous, paler and revolute at the edge; corollas 7–7.5 mm. long, the proper tube about 2.5 mm. in length, gradually expanded into the turbinate throat (about 3 mm. long), the teeth oblong-lanceolate, papillose toward the tip, 2 mm. long; achenes slender, smooth, about 4.5 mm. long, sometimes with slight folds of tissue between the ribs; pappus-bristles 60 or more, upwardly hispidulous-scabrid, not thickened at tip, in age reddish-brown.—Contrib. Gray Herb. lxi. 20 (1920).

Loja: at Loja, *Seemann*, no. 652 (K., phot. and small fragm. Gr.).

18. **M. Tafallana** HBK. Herbaceous perennial twiner; branches hexagonal, slightly puberulent; leaves broadly elliptic, acutish, entire, narrowly revolute on the margin, abruptly short-pointed at base, rough above, somewhat pubescent beneath, pinnately nerved from near the base (the nerves sometimes alternate), reticulate-veiny, about 9 cm. long, two-thirds as wide; petiole about 12 mm. long; corymb compound, trichotomous, round-topped; the heads about 12 mm. long, sessile by threes, crowded in rounded glomerules; involucral scales oblong, rounded at tip, brownish-puberulent and lightly striate dorsally, about 7 mm. long; corollas glabrous, about 7.5 mm. long; the proper tube 2.6 mm. long, gradually enlarged into a slender throat 3.5 mm. in length; teeth lanceolate, about 1.5 mm. long; obscurely hispidulous at tip, achenes slender, essentially smooth, tapering at base, 4.5 mm. long; pappus-bristles about 80, reddish-brown in age, very slightly or not at all thickened at tip, scabrid, about 8 mm. long. —Nov. Gen. et Spec. iv. 137 (1820); DC. Prod. v. 193 (1836). *M. Tafallae* Spreng. Syst. iii. 422 (1826). *Willoughbya Tafallana* (HBK.) Ktze. Rev. Gen. i. 373 (1891).

Guayas: from the banks of the Daule River, near Guayaquil, brought to Bonpland by *Tafalla* (Par., phot. and fragm. Gr.).

This species has rather closely the habit and foliage of the little understood *M. parviflora* (Aubl.) Karst. of French Guiana. Thanks to the kindness of Prof. Lecomte of the Museum of Natural History at Paris the writer has been able to examine an authentic fragment of *M. Tafallana*, and similarly through the courtesy of Mr. Rendle of the British Museum of Natural History has received not merely an excellent photograph but critical notes and measurements made from the type of *M. parviflora*. From these sources of information (together with a clear photograph of the type of *M. Tafallana* made by the writer at Paris some years ago), it appears that although the species possess striking similarity in most respects, their corollas are quite different, the relation of proper tube, throat, and teeth being in *M. Tafallana* 2.6 : 3.5 : 1.5 while in *M. parviflora* it is 3 : 1 : 1.5. From these figures it will be seen that in *M. Tafallana* the throat exceeds the proper tube, but in *M. parviflora* the proper tube is three times as long as the throat, and furthermore in *M. Tafallana* the throat is more than twice as long as the teeth, while in *M. parviflora* the teeth are longer than the throat. While from phytogeographic considerations it has seemed improbable that these plants would prove identical, their descriptions for a century have contained no sharp or

convincing differences. It is true *M. Tafallana* was said to be herbaceous and *M. parviflora* fruticose, yet anyone familiar with the varying estimates of tropical lignescent twiners knows how little diagnostic reliance may be placed on a distinction of this nature. Of course, when living or adequate dried material of the two can be brought together for comparison many other differences will doubtless appear. However, it is gratifying to have in the mean time some distinctions capable of measurement and clear record.

Reduced, doubtful or excluded Species.

M. corymbulosa Benth. Pl. Hartw. 211 (1845) = Kanimia corymbulosa (Benth.) Benth. & Hook. f. Gen. Pl. ii. 247 ex Hook. f. & Jacks. Ind. Kew. ii. 235 (1895). The genus *Kanimia*, differing from *Mikania* solely in the more numerous angles of the achenes, seems a rather artificial group, but if maintained (as seems at present expedient) it should include at least the typical form of *M. corymbulosa*. Of *M. corymbulosa*, var. *lojana* Hieron. in Engl. Bot. Jahrb. xix. 47 (1894) no material has been available for examination and it is impossible to say whether it should also be referred to *Kanimia* or be treated as a separate species under *Mikania*.

M. loxensis HBK. Nov. Gen. et Spec. iv. 136 (1820). Judged from description and a fairly clear photograph of the material type at Paris, this is nothing but a smoothish form of M. cordifolia (L. f.) Willd.

M. multinervia Turcz. Bull. Soc. Nat. Mosc. xxiv. pt. 2, 59 (1851). Although recorded as from Ecuador, the type material of this species came from Nariño, the southernmost department of Colombia as now delimited. The plant does not appear to have been rediscovered.

M. psilostachya or its var. racemulosa (Benth.) Bak. was vaguely recorded by Baker in Mart. Fl. Bras. vi. pt. 2, 266 (1876), as extending from Peru to Panama. However, neither the species nor variety seems to have been thus far collected in or reported from Ecuador.

M. scandens Hieron. in Engl. Bot. Jahrb. xxix. 17 (1900) and *M. scandens*, var. *cynanchifolia* Hieron. l. c. xix. 46 (1894), although not available for study during the preparation of this paper, are both inferred to be forms of *M. micrantha* HBK. (see p. 67).

M. Sodiroi Hieron. l. c. xxix. 16 (1900). This species (not seen) does not appear to differ in character from the earlier *M. leiostachya* Benth. (see p. 61).

PERU.

The chief sources of information regarding the Mikanias of Peru have to date been as follows:

1820. Humboldt, Bonpland & Kunth, Nov. Gen. et Spec. iv. 135, described as new *M. mollis*, founded on a plant collected by Humboldt & Bonpland on the banks of the Guancabamba. The type of this species appear, however, to be merely an unusually pubescent form of *M. cordifolia* (L. f.) Willd. A second species, *M. Tafallana*, also credited to Peru by the same authors, l. c. 137, came from what is now Ecuador.

1836. DeCandolle, Prod. v. 190–201, in his treatment of *Mikania*, besides renumerating the species of Humboldt, Bonpland & Kunth, described from Peru seven species of his own.

1843. Meyen & Walpers, Nov. Act. Nat. Cur. xix. Suppl. 1, 257 characterized as *M. variabilis* a plant from near Lima collected by Meyen.

1845. Poeppig in Poepp. & Endl. Nov. Gen. ac Spec. iii. 52–54 redescribed three of the DeCandollean species and added diagnoses of four more from localities within the present limits of Peru. His plants from Ega (in Brazil) are not here included.

1856. Schultz-Bipontinus, Bonplandia, iv. 54, in a list of Peruvian plants collected by Lechler, mentions quite without diagnosis or any descriptive notes, *Mikania tenax*, *M. Lechleri*, and *M. cuneata*, which are even yet nomina nuda.

1876. Baker in Mart. Fl. Bras. vi. pt. 2, 238 in assigning an extralimital range to *M. amara*, var. *guaco* (H. & B.) Bak. states that it occurs from Peru to Panama.

1905. Hieronymus in Engl. Bot. Jahrb. xxxvi. 470–475, lists eight species and one variety from Peru on the basis of a collection by von Jelski, the variety and no less than seven of the species being described as new.

1908. Hieronymus, l. c. xl. 389–393, founded on some of Prof. Weberbauer's plants four more species of Peruvian *Mikania*.

1911. Weberbauer in Engl. & Drude, Pflanzenw. xii. 150, 255, 284, and 289, mentions with indication of their geographic and ecological occurrence five species of Peruvian *Mikania*, four being the same as those described by Hieronymus from his collection.

1913. Muschler in Engl. Bot. Jahrb. l., Beibl. 111, p. 76, published his *Mikania carnosa*, a Peruvian species based upon a specimen collected by Prof. Weberbauer.

1920. Robinson, Contrib. Gray Herb. lxi. 13–22, pending the

delayed issue of the present paper, put on published record the diagnoses of seven new Peruvian Mikanias.

It is to be remarked that a considerable part of the Mikanias thus far discovered in Peru have come from two rather limited areas, one, explored by von Jelski, around Tambillo, Dept. Cajamarca, and the other, by Weberbauer, around Monzon, Dept. Huanuco. While these localities may be especially suited to the genus, it is probably that other regions in Peru will be found equally so when visited by collectors of like patience and discrimination, it being a well known fact that tropical twiners since exceptionally difficult to collect are commonly neglected by travellers with limited time.

Ser. I. Spiciformes DC. (see p. 27).

Key to Species.

a. Leaves (7–12 cm. long) acuminate to caudate or at least acutish at tip, pubescent on the nerves beneath *b*.
  b. Involucral scales about 5 mm. long; leaves scabrid above ..... 1. *M. psilostachya.*
  b. Involucral scales 2.5–3.5 mm. long; leaves softly hirtellous to glabrous above *c*.
    c. Leaves (at least the cauline) ovate, cordate; corolla-tube and throat glabrous ..... 15. *M. Haenkeana.*
    c. Leaves lance-ovate to -oblong, obtusely narrowed, rounded, or at most subcordate at base; corolla-tube glandular *d*.
      d. Corolla about 4.2 mm. long; heads shortly but perceptibly pedicelled; leaves pinnately 5-nerved .... 2. *M. Jelskii.*
      d. Corolla 2.6–3 mm. long; heads closely sessile; leaves 5-nerved essentially from the base ..... 3. *M. oreopola.*
a. Leaves (4–6 cm. long) narrowed to a rounded tip, glabrous on both surfaces ..... 4. *M. Szyszylowiczii.*

1. **M. psilostachya** DC. Prod. v. 190 (1836); Poepp. in Poepp. & Endl. Nov. Gen. ac Spec. iii. 54 (1845); Bak. in Mart. Fl. Bras. vi. pt. 2, 265 (1876). **For description see p. 30.**

Loreto: near Tocache, *Peoppig* (DC., phot. Gr.); Tarapoto, *Ule*, no. 6781 (K.). [Braz., Guiana, Colomb., Boliv.]

2. **M. Jelskii** Hieron. Somewhat woody twiner; stems round, corrugated, brown, tawny-pubescent, soon nearly or quite glabrate; leaves ovate-lanceolate, acuminate, entire, rounded or abruptly pointed or the larger cauline subcordate at base, about 1 dm. long, 3–5 cm. wide, firm-membranaceous, green on both surfaces, nearly glabrous and slightly shining above, dull, somewhat paler, and glandular-punctate beneath and on the nerves sparingly pubescent; lateral nerves 2 pairs, the first only 1–2 mm. from the base, the sec-

ond about 1 cm. above the base; petioles 6–18 mm. long, channeled above, rusty-pubescent, their bases connected by a narrow hairy ridge; panicles dense, leafy-bracted, rusty-pubescent, the branches divaricate or nearly so; heads about 7 mm. long, subsessile on the terminal branchlets; the spikes 1.5–5 cm. long, short-peduncled, rather dense, tending to branch at base; involucral scales oblong, obtusish, 3.4–3.8 mm. long, herbaceous, pubescent; corollas yellowish-white, densely beset with globular sessile glands; proper tube about 0.8 mm. long, gradually expanded into a turbinate throat about 1.5 mm. long, the teeth deltoid, acutish, 0.6 mm. long; achenes glandular; pappus-bristles 40 or more, brownish-white.—Hieron. in Engl. Bot. Jahrb. xxxvi. 475 (1905).

CAJAMARCA: near Cutervo, *von Jelski*, no. 634 (Brl., fragm. Gr.), also nos. 10 (Brl.) and 635 (Brl.).

3. **M. oreopola** Robinson (p. 16). A slender twiner with slightly hexagonal costulate hollow stems, the internodes sometimes as much as 12 cm. long; leaves elliptic- or somewhat subrhombic-ovate, acuminate, obscurely denticulate, obtusely narrowed at base, 9–10 cm. long, half as wide, slightly chartaceous, nearly glabrous on both surfaces, 5-ribbed from near the base, the ribs connected by numerous cross-veins; panicles opposite, pyramidal, pedunculate, about 14 cm. long and thick, leafy-bracted at base, the branches slender, widely spreading loosely spiciform; heads closely sessile, alternate or opposite, about 5 mm. long, subtended by small lance-linear bracts about 0.7 mm. in length; involucral scales oblong, 2.6–3 mm. long, 0.8 mm. wide, rounded at tip, nearly smooth, slightly thickened at base; corollas 2.5–3 mm. long, the proper tube glandular-granulated, 1.3 mm. long, the throat gradually but decidely enlarged, subcylindrical-campanulate, 1 mm. long; teeth deltoid, only 0.4 mm. in length; mature achenes smooth, dark-gray with lighter-colored angles, 2.5 mm. long; pappus-bristles about 40, sordid-white.

DEPT. NOT ASCERTAINED: St. Gavan (or Zavan?), July, 1854, *Lechler*, no. 2315 (K., phot. and fragm. Gr.).

4. **M. Szyszylowiczii** Hieron. Somewhat lignescent, glabrous; stems round but slightly corrugated; internodes 7.5 cm. long or less; leaves ovate or ovate-lanceolate, narrowed to a very blunt rounded tip, entire, slightly revolute on the margin, cuneate at base, thin-coriaceous, pinnately veined, glabrous on both surfaces, 4–6.5 cm. long, about half as wide; midrib and veins grooved above, exserted beneath, two pairs of the lateral veins thicker than the others and

leaving the midrib at a smaller angle; petiole 1–2 cm. long, slender; panicles terminal, pyramidal, their lower parts from the axils of foliaceous bracts; spikes dense, the upper subsimple, the lower commonly branched toward the base; bractlets narrowly deltoid, about 2 mm. long; heads sessile, about 5 mm. long; involucral scales oblong, rounded at tip, convex, slightly callous and gibbous at base, obscurely ciliolate, otherwise glabrous, in dried state dark-brown, 3 mm. long; corollas about 3 mm. long, the proper tube half this length, throat slightly enlarged, turbinate-campanulate, about equalling the teeth; achenes dark-brown, 2 mm. long, essentially smooth or perceptibly glandular between the ribs; pappus-bristles about 30, pale yellowish, thickened toward the tip.—Hieron. in Engl. Bot. Jahrb. xxxvi. 475 (1906).

CAJAMARCA: near Tambillo, *von Jelski*, no. 681 (Brl., fragm. Gr.).

Ser. II. RACEMOSAE (see p. 30).

KEY TO SPECIES.

a. Leaves rounded, subcordate, or obtusely pointed at base, ovate or lance-ovate to oblong or elliptical *b*.
b. Pedicels very short, rarely over 0.5–0.7 mm. long.....2. *M. Jelskii.*
b. Pedicels 1.5–4 mm. in length (species much in need of further study and sharper contrast than can be made here) *c*.
c. Leaves at most 4.5 cm. long *d*.
d. Involucral scales 2.5 mm. long, obtuse or subtruncate; leaves elliptical, mucronate.....5. *M. parvicapitulata.*
d. Involucral scales 4 mm. long, acutish; leaves ovate, with an elongated cuspidate-acuminate apex 6. *M. moyabambensis.*
c. Leaves 6–15 cm. long, elliptic-ovate; involucral scales about 3 mm. long, rounded at tip.....7. *M. decora.*
a. Leaves narrowly and sharply cuneate at base, tending to be obovate, acuminate to a rounded tip.....8. *M. tarapotensis.*

5. **M. parvicapitulata** Hieron. Twining shrub; stems round, at first glaucous and rusty- or dark-villous; internodes 1–5 cm. long; leaves elliptic, minutely toothed toward the mucronate apex, smooth, glaucous, and glandular-punctate on both surfaces, at most 4.5 cm. long and 2.5 cm. wide; one pair of lateral nerves leaving the midrib at the base and reaching about to the middle of the blade, another starting 3–6 mm. above the base and nearly attaining the tip; inflorescence racemose-paniculate, the divisions divaricate, the lower from the axils of leaflike bracts; pedicels 1.5–3 mm. long; bractlets linear, about 1.5 mm. long; involucral scales oblong, 1-nerved, subtruncate, about 2.5 mm. long, thickish, rather densely glandular-

villous on the back, dark in dried state; corollas whitish-yellow, 3 mm. long, sprinkled with globular sessile glands; proper tube about 1 mm. long; throat turbinate; teeth deltoid-ovate, 0.5 mm. long; achenes (very immature) 1 mm. long, sprinkled on angles with sessile capitate glands; pappus-bristles about 35–40, yellowish-white.—Hieron. in Engl. Bot. Jahrb. xl. 392 (1908).

HUACHUCO: in bushy places on the mountains to the south of the village of Monzon, Prov. Huamalies, alt. 2500–2900 m., *Weberbauer*, no. 3405.

Species not seen; the character here drawn with some condensation from the original description.

6. **M. moyobambensis** Hieron. l. c. 393. Twining shrub, the nearly round woody branches densely covered with dark-rusty tomentum; internodes 9 cm. long or less; leaves ovate, with a long cuspidate acumination, entire, rounded at base, revolute-margined, at most 4.5 cm. long and 2 cm. wide, chartaceous, somewhat 5-nerved; one pair of lateral nerves running from the base to about the middle, a second starting 5–6 mm. above the base and nearly attaining the tip; veins and veinlets somewhat depressed above and prominent beneath; petiole 3–8 mm. long, dark-rusty hairy; inflorescence racemose-paniculate; racemes pedunculate, simple or nearly so, the lateral from the axils of leaflike or much reduced bracts; pedicels 1–2 mm. long, rusty-velvety; bractlets linear, about 5 mm. long; involucral scales oblong, acutish, 5-nerved, thickish, herbaceous, 4 mm. long, sprinkled on the back with orange glands; corollas 3.5 mm. long, the tube about 0.75 mm. long, sprinkled with orange sessile capitate glands; throat suddenly enlarged, somewhat funnel-shaped, glabrous, 2 mm. long, teeth 0.75 mm. long; achenes (still immature) 2.5 mm. long, sprinkled with orange glands; pappus-bristles 30–35, yellowish-white, thickened at the summit.

LORETO: in bushy places on the plains, alt. 800–900 m., near the town of Moyobamba, *Weberbauer*, no. 4476.

Not seen; character here condensed from the original diagnosis of Prof. Hieronymus.

7. **M. decora** Poepp. Twining shrub; stems (attaining 6 m. or more in height) slender, round, at first glandular-puberulent; leaves ovate-oblong, sharply acuminate, obsoletely callous-denticulate, rounded at the base, at full maturity 15 cm. long, half as wide, firmly membranaceous, slightly puberulent beneath; petiole slender, about 1.5 cm. long; paniele terminal, compound, lax, leafy-bracted to the

middle, tawny-puberulent; the divisions slender-peduncled, exceeding the subtending bracts; heads subracemose; pedicels filiform, about 4 mm. long, bracteolate at base; bracteoles subulate, about 1.5 mm. long; involucral scales at first oblong, at maturity linear, about 3 mm. long, obtuse, glabrous or nearly so; flowers odorless; corollas white. —Poepp. in Poepp. & Endl. Nov. Gen. ac Spec. iii. 53 (1845).

ANCACHS: Prov. Pampayaco: in woods about Cuchero, *Poeppig*, no. 1654 (Naturhist. Mus. Vienna, phot. Gr.).
DEPT. NOT STATED: *Mathews*, no. 1737 (Gr., K.).
[Bolivia.]

8. **M. tarapotensis** Robinson. Probably twining and somewhat woody; stem round, covered with fine close tawny puberulence leaves oblong-oblanceolate, short-acuminate to a bluntish cuspidate tip, entire, sharply cuneate at base, 5–10 cm. long, 2–3 cm. wide, subcoriaceous, glabrous and dark-green above, beneath somewhat tawny, very closely and finely glandular-punctate and obscurely puberulent, 5(–7)-nerved; the first pair of lateral nerves inconspicuous, close to base, the second starting 7–10 mm. and the third (often alternate) 1.6–3 cm. above the base; petiole about 5 mm. long; panicle pyramidal, rather loose, about 1.4 dm. long and 1.2 dm. thick, tawny-puberulent, the ultimate branches 2–5 cm. long; pedicels filiform, 2–2.5 mm. long; bractlets 1.4–1.7 mm. long, linear; heads somewhat irregularly racemose; involucral scales linear, 4.5–5 mm. long, acutish, smooth except at the obscurely puberulent tip; corollas 3 mm. long, smooth; proper tube 1.5 mm. long; throat turbinate, 1 mm. long; teeth triangular-ovate, 0.5 mm. long; achenes 2–2.2 mm. long, black, slightly granulate toward the summit or wholly glabrous; pappus-bristles about 30, whitish, scarcely thickened upward.—Contrib. Gray Herb. lxi. 21 (1920).

LORETO: in mountains along the River Mayo, near Tarapoto, *Spruce*, no. 4822 (Gr.).

Ser. III. THYRSIGERAE (see p. 32).

KEY TO SPECIES.

a. Leaves triangular-ovate, with an angle on each side, cordate, subcordate, or hastate *b*.
  b. Leaves with lateral angles divaricate, the base subtruncate or shallowly subcordate with distinct acumination at petiole; pappus white ..... 9. *M. angularis*.

b. Leaves with lateral angles turned obliquely downward, basal sinus deep and rounded, with little or no acumination at petiole; pappus rufescent.....10. *M. laxa.*

a. Leaves ovate, cordate, without conspicuous lateral angles *c.*

c. Petiole one-tenth to one-third the length of the leaf-blade *d.*

d. Opposite petioles connate by a prominent thick ridge around the stem *e.*

e. Involucral scales tomentellous; leaves narrowly triangular-ovate, the veins depressed above.....11. *M. rugosa.*

e. Involucral scales subglabrous or slightly villous; leaves round-ovate, the veins exserted above....21. *M. trachodes.*

d. Petioles not at all connate at base *f.*

f. Pubescence whitish, dense, velvety, persistent; leaves about three-fourths as broad as long....12. *M. lanuginosa.*

f. Pubescence dark or tawny, villous or tomentose, tending to be deciduous; leaves rarely more than half as wide as long *g.*

g. Upper leaves ovate-oblong, merely rounded at base, the lower cordate, not strongly bullate 13. *M. Ruiziana.*

g. Upper leaves ovate and cordate as well as the lower, all strongly bullate at maturity.....14. *M. bullata.*

c. Petiole one-half to seven-eighths the length of the blade *h.*

h. Leaves ovate, about 5 cm. wide and half again as long, softly tawny-villous beneath.....15. *M. Haenkeana.*

h. Leaves suborbicular, about 1 dm. wide and scarcely longer, puberulent especially on nerves beneath 16. *M. monzonensis.*

a. Leaves neither hastate nor cordate at base *i.*

i. Leaves 3(–7)-nerved from near the base *j.*

j. Heads mostly pedicelled in rather open panicles; heads not crowded *k.*

k. Leaves ovate, rounded at base, not at all angled at the sides.....7. *M. decora.*

k. Leaves narrowly deltoid-ovate, subtruncate at base, with a slight angle at each side.....17. *M. incasina.*

j. Heads chiefly sessile or nearly so, crowded in panicled fascicles or subspiciform glomerules *l.*

l. Leaves broadly ovate; heads in short subspherical paniculately disposed spikes.....18. *M. platyphylla.*

l. Leaves lanceolate; heads usually in 3's to 5's at tips of branchlets.....19. *M. Stuebelii.*

i. Leaves clearly feather-veined *m.*

m. Heads sessile; leaves narrowly lanceolate.....29. *M. lanceolata.*

m. Heads slender-pedicelled *n.*

n. Stem very scabrous even in age; leaves thickish-chartaceous, rounded at base.....21. *M. trachodes.*

n. Stem soon glabrate and (though striate-sulcate) smooth to the touch; leaves acute or shortly acuminate at base *o.*

o. Leaves lanceolate, coriaceous, scarcely paler and not clearly punctate beneath; veinlets depressed above.....20. *M. lancifolia.*

o. Leaves ovate-lanceolate to broadly ovate, membranaceous, glaucous and finely dark-punctate beneath.....22. *M. Mathewsii.*

9. **M. angularis** H. & B. Pl. Aeq. ii. 87, t. 106 (1809). With large triangular-hastate leaves having a sharp divergent angle on each side of the shallowly cordate base. For further description see p. 33.

HUANUCO: in light woods on level ground near the Monzon River, Prov. Huamalies, alt. 600–700 m., *Weberbauer*, no. 3640 (Brl., fragm. Gr.).
[Ecuad., Colomb., and, acc. to Baker, Dutch Guiana.]

10. **M. laxa** DC. Twining shrub; stem terete or slightly angled at first, in dried state striate-sulcate, when young fulvous-puberulent, soon entirely glabrate; internodes 5–14 cm. long; leaves triangular-hastate, acuminate, entire or slightly undulate, cordate by a rather deep but open and rounded sinus, 3(–7)-nerved from the very base, membranaceous, above sparingly puberulent on the nerves and chief veins, below at first rufous-velvety, about 1 dm. long and 7 cm. wide; petiole slender, about 2.5 cm. long; panicles terminal on the upper branches, ovoid, loose; bracts lanceolate, petiolate; branches opposite and alternate, spreading to divaricate, rufous-tomentellous; pedicels 2–3 mm. long; bractlet borne at summit of pedicel, linear-lanceolate, tomentellous, about half as long as the involucre; scales of the latter oblong, puberulent especially toward the obtuse apex, 5 mm. long; corollas (immature) glabrous, the teeth lance-oblong, considerably exceeding the short throat; pappus-bristles about 50, rufous.—Prod. v. 200 (1836); Bak. in Mart. Fl. Bras. vi. pt. 2, 250 (1876). *M. armigera* Poepp. in Poepp. & Endl. Nov. Gen. ac Spec. iii. 52, t. 260 (1845).

ANACHS: at the edge of woods, Cuchero, *Poeppig*, no. 29 (DC., phot. Gr.); in shrubby places of the subandean region, Pampayaco (=Cuchero), *Poeppig*, no. D (Naturhist. Mus. Vienna, phot. Gr.).
[W. Braz. acc. to Bak. l. c.]

Microscopic comparison of clear photographs of the types of *M. laxa* at Geneva and *M. armigera* in Vienna fails to disclose any significant difference. The trifling divergence of the original diagnoses appears to be merely such as would result from different methods of interpretation and description rather than from any real differences in the plants characterized.

Baker, l. c. 255, is certainly wrong in placing *M. armigera* in the synonymy of the Brazilian *M. salviaefolia* Gardn., which exhibits a variety of differences (more narrowly triangular leaves densely canescent-tomentellous beneath, much broader ovate bracts, shorter pedicels, etc.).

11. **M. rugosa** Robinson. Twining shrub; stems somewhat 6-angled, densely and sometimes retrorsely tawny-tomentellous, solid;

pith white; internodes 9–12 cm. or more in length; leaves rather narrowly ovate, gradually narrowed almost from the base to an attenuate tip, remotely and very obscurely cuspidate-denticulate, cordate with rounded lobes and shallow but narrow sinus, subcoriaceous, above finely fulvous-pilose, minutely papillose, conspicuously bullate-rugose, beneath densely fulvous-tomentose, 10–11 cm. long, about half as wide, 3(–7)-nerved from the base; petioles about 2.5 cm. long, stout, terete, tawny-tomentose, flexuous and contorted, the members of each pair connected at base by a thick transverse ridge; panicle large, probably 3–5 dm. long, 2.5 dm. thick, the lower divisions opposite in the axils of the upper leaves, pedunculate, often leafy-bracted below; their branches spreading, opposite or alternate, sometimes flexuous, tawny-tomentellous; terminal pedicels scarcely 0.5 mm. long, the others 3–5 mm. in length; bractlet borne high on pedicel or at its summit, narrowly lance-oblong, 2 mm. long, tomentellous on the back; involucral bracts oblanceolate-oblong, subacute, fuscous, 4 mm. long, tawny-tomentellous on back; corollas whitish, the proper tube 1.7 mm. long, obscurely appressed-hirtellous, throat of equal length, broadly campanulate, glabrous, teeth ovate-lanceolate, 1.5 mm. long; achenes 3 mm. long, sparingly glandular-roughened between the paler ribs, somewhat tapering near the base; pappus-bristles about 30, yellowish-white, disarticulating readily.—Contrib. Gray Herb. lxi. 20 (1920).

Puno: in bushy places, alt. 2400–2500 m., Ramospata, on the way from Sandia to Chunchusmayo, 27 July, 1902, *Weberbauer*, no. 1323 (Brl., phot. and fragm. Gr.).

12. **M. lanuginosa** DC. Prod. v. 201 (1836). For description, etc. see p. 35.

Puno: in shrubby thickets chiefly of bamboos, alt. 2600–3000 m., Sandia, *Weberbauer*, no. 755 (Brl., phot. and fragm. Gr.).
[Venez., Colomb., Boliv., Braz.]

13. **M. Ruiziana** Poepp. in Poepp. & Endl. Nov. Gen. ac Spec. iii. 53 (1845). For description see p. 34.

Ancachs: borders of the woods in the subandean region, at Cuchero, *Poeppig* (Naturhist. Mus. Vienna, phot. Gr.).
Loreto: near Tarapoto, *Spruce*, no. 4079 (Gr.).
[Ecuad., Colomb.]

14. **M. bullata** Robinson. Climbing shrub; stems terete, densely covered with tawny spreading or deflexed soon mostly deciduous tomentum; internodes, 5–13 cm. or more in length; leaves ovate,

acute, obscurely denticulate (teeth 0.3 mm. high, 3–8 mm. apart), cordate by a narrow acute sinus, sometimes conduplicate, 9–10 cm. long, about two-thirds as wide, harsh and chartaceo-coriaceous, above tawny-pilose, strongly bullate and very scabrous from the persistent pustule-like bases of the deciduous hairs, beneath persistently tawny-villous and finely punctate, pinnate-veined; the veins and veinlets strongly exesrted on the lower surface; petiole stout, round, tawny-tomentose, 1–2.5 cm. long; panicles dense, tawny-tomentellous, leafy-bracted, the bracts large, often equalling the subtended portions of the panicle; pedicels mostly 2–3 mm. long; involucral scales oblong, rounded at tip, 4 mm. long, at first a little tawny-pilose, later subglabrate and more or less dark-punctate; corollas 4 mm. long, nearly smooth, the proper tube 1.5 mm. long, slender, the throat broadly campanulate, 1.2 mm. long, the teeth about 1.3 mm. long; achenes brownish-olivaceous, 3 mm. long, somewhat tapering at the base, obsoletely papillate on the faces; pappus-bristles 35–45, sordid-white, decidedly thickened toward the tip.—Contrib. Gray Herb. lxi. 13 (1920).

Puno: in bushy places between Tambo Ichubamba and Tambo Yuncacoyo, on the way from Sandia to Chunchusmayo, alt. 1800–2000 m., *Dr. A. Weberbauer* (Brl., phot. and fragm. Gr.).

15. **M. Haenkeana** DC. Herbaceous twiner; stems round, at first tawny-tomentellous, soon almost or quite glabrate, pruinous, striate; internodes 1 dm. or more in length; leaves ovate, caudate-acuminate, entire or nearly so, cordate by a narrow sinus (or the upper leaves merely rounded) at base, 7-12 cm. long, 4-9 cm. wide, softly membranceous, green and somewhat obscurely hirtellous above, beneath paler, glandular-puncticulate and softly tawny-villous especially on the 5–7 nerves; the reticulated veinlets more or less translucent; petioles tawny-villous, 3.5–5.5 cm. long; panicles pyramidal, the thyrsoid divisions usually pedunculate from the axils of the upper leaves or foliaceous bracts; heads sessile or nearly so in congested spiciform continuous or at length more or less interrupted glomerules; involucral scales linear-oblong, acutish, stramineous, pubescent on the back, about 3.2 mm. long; corollas whitish, of delicate texture, glabrous, about 3 mm. long, the proper tube gradually expanded into the narrowly turbinate throat, the teeth very short, about 0.3 mm. long, bearing on the back a few sessile globular orange glands; achenes black, glabrous or obsoletely hispidulous toward the summit, 1.5 mm. long; pappus-bristles 30 or more, delicate, white.—Prod. v. 196 (1836). *M. pellucidivenia* Hieron. in Engl. Bot. Jahrb. xxxvi. 474 (1905)?

Huanuco ? in mountains of Peru, *Haenke* (DC., phot. Gr.). It is inferred that DeCandolle's original locality "in montanis Orinocensibus" was a clerical error for in montanis Huanucensibus, Haenke having done most of his Peruvian collecting while resident at Huanuco.

Cajamarca: near Tambillo, *von Jelski*, no. 600 (Brl., fragm. Gr.) and 642.

Peru without locality: *Mathews* (N. Y.).

16. **M. monzonensis** Hieron. Herbaceous twiner; stems round, striate, at first glandular-pubescent, soon glabrate, pruinose; internodes probably as much as 1.5 dm. long; leaves suborbicular, cuspidate-acuminate, obsoletely mucronate-denticulate (teeth scarcely 0.25 mm. high, 3–8 mm. apart), cordate at base, membranaceous, puberulent and glandular-atomiferous on both surfaces, especially along the nerves, about 1 dm. long and nearly as wide, somewhat 7-nerved from the very base, the nerves connected by subparallel transverse veins and the veinlets reticulated; petiole sometimes as much as 8 cm. long, glandular-pubescent; panicles pyramidal, the lower primary divisions from the axils of petiolate leaflike bracts, the secondary divisions spiciform, the ultimate branchlets very short, bearing 3–5 sessile heads; bracteoles subulate, scarcely 4 mm. long, pubescent; involucral scales oblong, acutish, rusty-ochraceous, 3-nerved, 3 mm. long, the outer villous on the back, the inner hyaline-margined, glabrous; corollas 2.5 mm. long, yellowish (after drying); the proper tube cylindrical, 1 mm. long, the throat turbinate, 1.25 mm. long, the teeth deltoid, scarcely 0.25 mm. long; achenes (still immature) 0.75 mm. long, villous at the summit; pappus-bristles 35–40, yellowish-white, a little thickened toward the whitish summit.—Hieron. in Engl. Bot. Jahrb. xl. 391 (1908); Weberbauer in Engl. & Drude, Pflanzenw. xii. 284 (1911).

Huanuco: Prov. Huamalies, alt. 900–1000 m., in scattered woods and bushy places, *Weberbauer*, no. 3430.

Not seen; the description here condensed from the original diagnosis. From character suspiciously close to the preceding.

17. **M. incasina** Robinson (p. 11). Probably a somewhat woody twiner; branches nearly terete, brown, at first puberulent but soon glabrate, becoming many-ribbed when dried; leaves rather narrowly deltoid-ovate, essentially entire, subtruncate at base, gradually narrowed to an acuminate tip, membranaceous, 5–7 cm. long, about half as wide, with a slight but usually perceptible angle at each side between the base and side, above green, sparingly hirtellous, beneath gray-tomentellous; petioles slender 1.5 cm. long, those of the same pair united by an elevated and hairy transverse line; panicles

terminal, conical, rather loose, leafy-bracted, 2 dm. or more in length, 1 dm. in diameter, puberulent; pedicels 0.5–2 mm. long; heads about 9.5 mm. long, closely subtended by a linear puberulent bractlet about 3.2 cm. in length; involucral scales substramineous, oblong, obtuse, about 5 mm. long and 2 mm. wide, slightly puberulent and obscurely striate; corollas about 5.8 mm. long, glabrous, apparently white; proper tube 2.4 mm. long; the throat 0.8 mm. long; teeth lanceolate, 1.8 mm. long, nearly 1 mm. wide; immature achenes 3.2 mm. long; pappus-bristles about 50, yellowish-white.

AMAZONAS: Chachapoyas, *Matheus* (K., phot. and fragm. Gr.).

18. **M. platyphylla** DC. Probably a half-shrubby twiner; stem terete, striate-sulcate, at first puberulent, soon glabrate; internodes probably 1 dm. or more in length; leaves opposite, broadly ovate, definitely cuspidate, entire, 8–10 cm. long, three-fourths as wide, glabrous but obscurely papillose on both surfaces, membranaceous, 5(–7)-nerved from near the abruptly pointed base; petiole glabrous, about 2.6 cm. long; panicle probably large, the lower divisions (all that are known) opposite, pedunculate, deflexed, sordidly crisped-puberulent, leafy-bracted; heads closely sessile, crowded in short glomerule-like subglobose spikes; bracteoles lanceolate, puberulent, 2.5 mm. long; involucral scales 3.5–4 mm. long, narrowly oblong, scarious-margined, of firm texture, obscurely puberulent on the back especially toward the tip, obtuse, slightly thickened at base; corollas about 6 mm. long, the proper tube slender, gradually enlarged into an ill-defined throat; teeth short, triangular; achenes (very immature) 1.3 mm. long; pappus-bristles about 40, rufous, not thickened upward.—Prod. v. 195 (1836); Poeppig in Poepp. & Endl. Nov. Gen. ac Spec. iii. 53 (1845).

LORETO: Prov. Maynas, in woods, *Poeppig*, no. 2148 (DC., phot. and fragm. from Klatt herb. now in Gray Herb.).

This little known species in difficult to place satisfactorily in any one of the series defined by inflorescence. The heads are technically spicate, but the spikes are disposed in a panicle and so short as to appear like subspherical glomerules.

19. **M. Stuebelii** Hieron. in Engl. Bot. Jahrb. xxi. 333 (1895). Leaves (in typical form) lanceolate, attenuate, entire or inconspicuously few-toothed, coriaceous and somewhat lucid; panicle of few rather widely separated glomerules. For further characters see p. 36.

AMAZONAS: Prov. Chachapoyas, *Mathews* (K.).
HUANUCO (?): "Montana Peruvia Quanocensis," *Haenke* (Brl., phot. and fragm. Gr.).
[Colomb.]

20. **M. lancifolia** Robinson. Twining shrub; stem at first angulate, soon terete, soft-woody, pithy, sulcate-striate (after drying), when young sparingly yellowish-villous, later entirely glabrate; leaves (only the floral known) often deflexed, lanceolate, attenuate, remotely and obscurely callous-denticulate, subacute at base, about 7 cm. long, about one-fourth as wide, feather-veined, above subglabrous, rugose and rugulose, chartaceo-coriaceous; petiole slender, 7–9 mm. long; panicle terminal, about 3 dm. long and 2 dm. thick, leafy-bracted nearly to the summit; the divisions opposite, spreading, pedunculate, hirtellous; pedicels slender, spreading, mostly 3–4 mm. long; bracteoles lance-linear, about 2 mm. long, borne at the summit of the pedicel; involucral scales linear-oblong, acutish, dark reddish-brown, essentially glabrous, at full maturity 4.5 mm. long; corollas white, glabrous, proper tube 1.5 mm. long, throat campanulate, of equal length, teeth about 1 mm. long; achenes dark-olivaceous, lucid, 3.7 mm. long; pappus-bristles about 36, brownish-white.—Contrib. Gray Herb. lxi. 17 (1920).

PUNO: in shrubby places between Tambo Yuncacoya and Tambo Cachicachi on the way from Sandia to Chunchusmayo, alt. 1800–2200 m., *Weberbauer*, no. 1137 (Brl., phot. and fragm. Gr.).

21. **M. trachodes** Robinson. Robust twining shrub; stems terete, striate-costulate after drying, pithy, 5 mm. or more in diameter, yellowish-brown, strigillose-papillose and exceedingly scabrous; internodes 12 cm. or more in length; branches terete, subappressed-villous or -setulose; leaves broadly ovate, acuminate, remotely callous-denticulate (teeth at most 0.5 mm. high and 1 cm. apart), rounded at base, not at all decurrent on the petiole, 13–15 cm. long, about 8 cm. wide, firmly subcoriaceous, pinnately veined (but with 2 pairs of veins much more prominent and nerve-like than the others), above appressed tawny-puberulent on the nerves, beneath spreading-villous on the reticulated veinlets as well; petioles subterete, yellowish-tomentose, about 1.5 cm. long, flexuous, each pair connected at base by a thickish papillose-tomentose ring or fold; panicle large, 4 dm. long or more, decompound, rather dense, closely villous-setulose; pedicels slender, of unequal length; bracteole lanceolate, thin, acute, dorsally somewhat villous, borne at summit of the pedicel and about half as long as the

involucre; involucral scales lance-linear or narrowly oblong, acutish, brownish-stramineous, dorsally a little villous, 4 mm. long; corollas whitish, about 3.8 mm. long, externally somewhat villous especially at the base of the throat and on the teeth; proper tube about 1.2 mm. long; throat 1.6 mm. long and the teeth 1 mm. long; achenes olivaceous, shining, 2 mm. long; pappus-bristles about 40, dirty-white, slightly thickened below the acute tip.—Contrib. Gray Herb. lxi. 22 (1920).

HUANUCO: Prov. Huamalies: in bushy places on mountains southwest of Monzon, alt. 2500–2900 m., *Weberbauer*, no. 3395 (Brl., phot. and fragm. Gr.).

22. **M. Mathewsii** Robinson. Soft-wooded probably twining shrub; stem terete, striate-sulcate, at first sordid- or fulvous-tomentellous, soon subglabrate though retaining a slight puberulence especially about the nodes; leaves broadly ovate to ovate-oblong (the rameal lance-ovate), acuminate at both ends, entire, narrowly revolute, 12–14 cm. long, 5–9 cm. wide, pinnately veined, membranaceous, above green, glabrous and slightly lucid, beneath much paler, dark-punctículate and on the midrib and chief veins somewhat puberulent; panicle large, compound, tawny-tomentellous, leafy-bracted, the divisions opposite, ascending their branches usually divaricate, the ultimate branchlets somewhat corymbosely capituliferous toward the tip; pedicels filiform, 1–3 mm. long, bracteolate at base, the terminal one very short; bracteole ovate, ciliolate; involucral scales ovate-oblong, obtuse, thin, brownish-stramineous, slightly puberulent near the tip and often tumid base, 3 mm. long; corollas subglabrous, the proper tube slender, smooth, about 1.3 mm. long, the glabrous throat campanulate, 1.7 mm. long, the teeth about 0.8 mm. long, minutely hispidulous; achenes 3 mm. long, brown, nearly smooth; pappus-bristles about 30, brownish-white.—Contrib. Gray Herb. lxi. 18 (1920).

PERU WITHOUT LOCALITY: in the Andes, *Matheus*, no. 1368 (Gr., N. Y.); *Fielding* (Gr.).

Ser. III. CORYMBOSAE (see p. 39).

KEY TO SPECIES.

a. Leaves bi- to tri-pinnate; leaflets less than 1 cm. in diameter
23. *M. filicifolia*.

a. Leaves simple *b*.
b. Leaves very small, less than 1 cm. long, triangular, cordate-subsagittate.....24. *M. brachyphylla*.
b. Leaves much larger, 3.5–20 cm. long *c*.
c. Heads sessile *d*.

d. Leaves broadly rhombic-ovate to suborbicular, more than half as wide as long *e*.
e. Heads clustered in 3's to 5's at the tips of the ultimate branchlets of the corymbs *f*.
f. Heads large, 10–12 mm. long *g*.
g. Leaves membranaceous, conspicuously cuneate-decurrent on the petiole, the veins not standing out beneath.....25. *M. guaco.*
g. Leaves subchartaceous or subcoriaceous, rounded or abruptly pointed at base, tomentellous and conspicuously reticulated beneath, the veins standing out.....26. *M. speciosa.*
f. Heads smaller, 6–8 mm. long *h*.
n. Leaves thin-membranaceous, conspicuously decurrent on the petiole; bractlets lance-linear, not petiolate.....27. *M. brachiata.*
n. Leaves chartaceo-subcoriaceous, rounded or acute at base but not decurrent on petiole; bractlets elliptic-spatulate, petiolate....28. *M. loretensis.*
e. Heads in short paniculately disposed spikes 18. *M. platyphylla.*
d. Leaves lanceolate to ovate-oblong, not half (rarely much over a third) as wide as long *i*.
i. Involucral scales spatulate, about 3 mm. long 29. *M. lanceolata.*
i. Involucral scales oblong, 4.5–6.5 mm. long *j*.
j. Leaves glabrous; petioles 1–3 cm. long *k*.
k. Pappus flesh-colored, scarcely or not at all thickened at the summit....30. *M. tambillensis.*
k. Pappus white, distinctly thickened at tip.....31. *M. Weberbaueri.*
j. Leaves pubescent beneath; petioles about 4 mm. long.....32. *M. pycnadenia.*
c. Heads definitely (though sometimes shortly) slender-pedicelled *l*.
l. Stems hexagonal *m*.
m. Angles riblike, not winged *n*.
n. Stem permanently puberulent to tomentellous; leaves cordate, membranaceous.....33. *M. cordifolia.*
n. Stem soon entirely glabrate; leaves not cordate, fleshy.....37. *M. carnosa.*
m. Angles with very narrow subherbaceous wings 34. *M. microptera.*
l. Stems terete or nearly so, after drying multi-striate or -costulate *o*.
o. Heads small (about 6–7.5 mm. long) *p*.
p. Leaves rhombic-ovate, rounded toward the base then cuneately decurrent on the petiole, not at all cordate; leaves 7–7.5 mm. long....27. *M. brachiata*
p. Leaves triangular-ovate, cordate or somewhat hastate; leaves about 6 mm. long.....35. *M. micrantha.*
o. Heads considerably larger, over 1 cm. long *q*.
q. Petiole 2–4 cm. long; stipuliform appendages large; involucral scales lance-oblong, subherbaceous, 3–4 mm. wide; corolla dark violet 36. *M. crassifolia.*
q. Petiole 5–10 mm. long; stipuliform appendages none; scales lance-linear, stramineous; corolla pale yellow.....37. *M. carnosa.*

23. **M. filicifolia** Robinson. Slender trailing herb with spreading branches; stem purplish-brown, scarcely 2 mm. thick, sulcate-costate, at first puberulent, soon entirely glabrate; internodes 3–10 cm. long; leaves opposite, bi- to tri-pinnately divided, 2–3 cm. long, 1.5–2.4 cm. wide, slender-petioled; leaflets ovate-elliptic to suborbicular, usually entire, obtuse, 3–6 mm. in diameter, petiolulate (the terminal apt to be lanceolate and acute), puberulent at least on the midrib beneath; corymbs trifid, 4–7.5 cm. wide, flattish, puberulent; pedicels 1.5–2.5 mm. long; bracteoles broadly ovate, acute, herbaceous, 2.5–4 mm. long; heads about 8 mm. long; involucral scales lance-linear, attenuate, stramineous, slightly callous toward the base; corollas 5.5 mm. long, smooth, pale, the proper tube 3 mm. long; the throat scarcely 1 mm. long and but little enlarged; the teeth linear-lanceolate, 1.5 mm. long; achenes (very immature) crowned by a slightly expanded pappus-bearing disk; pappus-bristles about 40, finely capillary, white, not thickened toward the summit.—Contrib. Gray Herb. lxi. 14 (1920).

Cuzco: Machu Picchu, alt. about 2100 m., *Cook & Gilbert*, no. 853 (U. S., phot. and fragm. Gr.).

A striking species with delicate, fern-like foliage.

24. **M. brachyphylla** Hieron. Slender herb; stems dull purplish-brown, somewhat 4-angled, glabrous or nearly so; internodes mostly short but sometimes toward 1 dm. long; leaves opposite, simple, very small, at most 1 cm. long and 7 mm. wide, triangular-ovate, rather deeply sagittate-cordate, entire or obscurely 2–3-toothed on each side, scabrid above, appressed-hirtellous on the nerves beneath, sub-triplinerved from the base; petiole about 5 mm. long; stipular ring bearing on each side 3–5 filiform ciliated appendages 1–3 mm. in length; corymbs terminal; heads about 9 mm. long, pedicellate; bracteoles ovate, herbaceous, borne at the summit of the pedicel; involucral scales oblong, obtuse, puberulent, about 5 mm. long; corollas (after drying) yellowish; the throat subcylindrical-campanulate, 3 mm. long, about equalling the proper tube; the teeth deltoid, short, granular on the outer surface; pappus-bristles 75 or more, tawny-buff, not thickened upward.—Hieron. in Engl. Bot. Jahrb. xxxvi. 472 (1905).

Cajamarca: near Tambillo (Chanta Cruz), alt. 2600–2700 m., *von Jelski*, no. 703 (Brl., fragm. Gr.).

25. **M. guaco** H. & B. Pl. Aeq. ii. 84, t. 105 (1809); HBK. Nov. Gen. et Spec. iv. 136 (1820). *M. amara*, var. *Guaco* (H. & B.) Bak.

in Mart. Fl. Bras. vi. pt. 2, 237, t. 66 (1876), where the undescribed *M. cuneata* Sch.-Bip. (Bonplandia, iv. 54), founded on Lechler's no. 2477, is cited as an unquestioned synonym. ? *M. attenuata* DC. Prod. v. 195 (1836).—Leaves membranaceous, broadly ovate, somewhat puberulent or pubescent on both surfaces, the blade partially rounded at base then cuneately decurrent on a rather long petiole. For further characters see p. 46.

PERU (without locality), acc. to Baker, l. c., a record probably based on Lechler's no. 2477 (the type of the undescribed *M. cuneata* Sch.-Bip., a plant not seen by the writer).
[Cent. Am. to Boliv. and Braz.]

M. attenuata DC., here doubtfully referred to this species, has been studied chiefly from a photograph of the type-material in the De-Candollean Prodromus herbarium at Geneva. From this it appears that the habital correspondence is close and the original diagnosis fails to show any very significant differences except the smoothness of the leaves, which may in the brevity of the description have been somewhat overstated.

26. **M. speciosa** DC. Suffruticose tall twiner; stem terete fistulose, covered with a short dense velvety puberulence; internode, sometimes 17 cm. or more in length; leaves broadly ovate, acuminates entire or nearly so, the lower subcordate, the upper rounded at base, but at the insertion cuneately decurrent on the petiole, 10–15 cm. long, more than half as wide, above dull green, minutely scabrid-puberulent, beneath gray-tomentellous and prominulently reticulated, near the base pinnately several-nerved, then more prominently 3-nerved from a point considerably above the base, membranaceous; petiole 3–6 cm. long, winged toward its distal end; corymbs large, trichotomous, strongly convex; heads about 12 mm. long, sessile by 3's; bractlets linear, acute, 2–3 mm. long; involucral scales narrowly oblong, obtuse, puberulent and glandular on the back, 5–6 mm. long, corollas about 6.2 mm. long, essentially glabrous; proper tube slender; 3.6–4 mm. long; throat turbinate, 1.4 mm. long; teeth lance-oblong, about 1.4 mm. long; achenes dark-gray, tapering at base, about 5 mm. long; pappus-bristles about 65, not thickened at tip, in age slightly flesh-colored.—Prod. v. 196 (1836).

CUZCO: climbing on trees in forest, San Miguel, Urubamba Valley, alt. about 1800 m., *Cook & Gilbert*, no. 947 (U. S., phot. Gr.).
DEPT. NOT STATED: *Haenke* (DC., phot. Gr.).
[Boliv.]

The description of this species has been drawn, as to its details,

from the plant of Cook & Gilbert which appears to agree with the photograph of the type. More material is needed to determine the precise relation of this species to *M. guaco*, *M. Tafallana*, and *M. dictyophylla*.

27. **M. brachiata** Poepp. Twining shrub; stems slender, subterete, multicostulate, sharply scabrous especially near the nodes, brown, fistulose; internodes elongated (sometimes 1.5–2 dm. in length); leaves rhombic-ovate gradually acuminate, undulate-denticulate, narrowed at base or more often rounded and then rather abruptly cuneate-decurrent on the petiole, 8–10 cm. long, 4.5–7 cm. wide, membranaceous, thin, glabrous or scabrid with minute tumid-based hairs; petiole 1.5–3.5 cm. long, puberulent; the chief lateral nerves leaving the midnerve about 1.5–2 cm. from the base, curved-ascending and connected with the midnerve by subparallel cross-veins; panicle-branches opposite, brachiate, often 1.3–1.5 dm. long, naked to the rather dense corymbs at the ends; bracts small, lanceolate, petiolate; bracteoles lance-linear, pubescent; heads about 7 mm. long, subsessile; involucral scales linear-oblong, 4.5 mm. long, brownish, substriate, dorsally puberulent especially toward the deltoid obtusish tip; corollas yellowish-green to brownish, about 4.5 mm. long; proper tube slender, 2 mm. long, rather suddenly enlarged into a campanulate throat of equal length; teeth deltoid, 0.5 mm. long, dorsally hispidulous; achenes slender, 2.6 mm. long, slightly puberulent; pappus-bristles 35–45, flesh-colored, capillary, not thickened upward.—Poepp. in Poepp. & Endl. iii. 53 (1845).

Loreto: in forests at Tocache, *Poeppig*, no. 2041 (Naturhist. Mus. Vienna, phot. Gr.).

Huanuco: Prov. Huamalies: both cultivated and wild in woods about Monzon, *Weberbauer*, no. 3442 (Brl., phot. and fragm. Gr.).

28. **M. loretensis** Robinson (p. 15). A slender twiner; stem purplish, terete, or nearly so, tawny-puberulent; internodes sometimes 12. cm. or more in length; leaves ovate, acute or shortly acuminate, subentire, rounded at base, 6–8 cm. long, 3.5–4.5 cm. wide, above green, nearly glabrous and finely reticulated, beneath scarcely paler, dull, minutely puberulent on nerves and prominulent reticulated veins, pinnately 5-nerved, the lowest pair of lateral nerves arising about 2 mm. and the second pair about 1 cm. above the base; corymbs convex, 3–12 cm. in diameter, on divaricate curved nearly naked pedunceles and together forming an interrupted leafy-bracted panicle bractlets elliptic-spatulate 3.5 mm. long, petiolate; heads 8 mm. long, sessile and mostly ternate on the tips of the ultimate branchlets of the

corymbs; involucral scales oblong, obtuse, 6.6–8 mm. long, dorsally nearly smooth, callous-tumid at base; corollas whitish, smooth; proper tube 2–2.2 mm. long; throat cylindrical, 2.3–2.5 mm. in length; teeth deltoid, about 9.5 mm. long; achenes about 2.5 mm. long; pappus-bristles about 50, flesh-colored, not thickened at tip.

Loreto: Inquitos, *E. Ule*, no. 6238 (K., phot. Gr.).

29. **M. lanceolata** Hieron. in Engl. Bot. Jahrb. xxix. 17 (1900).—Leaves narrowly lanceolate, long-acuminate, feather-veined; involucral scales spatulate, 3 mm. long. For further characters see p. 64.

Cajamarca: near Tambillo, *von Jelski*, nos. 601, 745, and 746, acc. to Hieron. l. c.
[Ecuad.]

30. **M. tambillensis** Hieron. Twining shrub, puberulent on the axis and branches of the inflorescence, otherwise glabrous throughout; stem subterete, striate-sulcate, purplish-brown, fistulose; internodes 5-7 cm. long; leaves ovate-oblong or -lanceolate, acute or abruptly acuminate, entire, shortly pointed or almost rounded at base, 8–12 cm. long, 3–5 cm. wide, pinnately 5-nerved; first pair of nerves starting from midnerve about 3 mm., the second about 6–10 mm. above the base, all exserted on both surfaces, connected by subparallel immersed veins; petioles smooth, channeled above, 1.5–1.8 cm. long; panicles pyramidal, the lower divisions in the axils of the upper leaves; heads about 8 mm. high, sessile in clusters of 3–7 at the tips of the ultimate branchlets (3–4 mm. in length) of the corymbs; bracteoles linear, ciliate, about 2 mm. long; involucral scales lance-oblong, narrowed to an obtuse point, brownish-stramineous, 4.5 mm. long; corollas smooth, 6–6.5 mm. long; proper tube gradually expanded into a cylindric-subturbinate throat; teeth deltoid, acute, about 0.5 mm. long; pappus-bristles about 33, buff, capillary and not thickened upward.—Hieron. in Engl. Bot. Jahrb. xxxvi. 470 (1905).

Cajamarca: near Tambillo, *von Jelski*, no. 762 (Brl., fragm. Gr.).

31. **M. Weberbaueri** Hieron. Twining shrub; branches olive-green, hollow, striate-sulcate; internodes as much as 19 cm. long; leaves ovate-oblong or sublanceolate, acuminate, mucronate, entire, very smooth, rounded or shortly cuneate at base, subtriplinerved 5–10 mm. above the base, at largest 13 cm. long and 5 cm. wide; petioles 2–3 cm. long; inflorescence a thyrselike panicle; heads sessile or nearly so (pedicels scarcely over 1 mm. long) and clustered at the tips of the

ultimate branchlets (usually about 1 cm. long) of the corymbs; involucral scales 5 mm. long, obtusish or acutish, puberulent on the dark-stramineous 5–7-nerved back, ciliate toward the tip; corollas about 6 mm. long; tube not enlarged upward; teeth of the limb oblong, about 1 mm. in length; unripe achenes 1 mm. long, sparingly villous at the summit; pappus-bristles 35–40, whitish, thickened at tip.—Hieron. in Engl. Bot. Jahrb. xl. 389 (1908).

HUANUCO: Prov. Huamalies, in sparse woods and bushy places, alt. 900–1000 m., near Monzon, *Weberbauer*, no. 3426.

Not seen. Description compiled. Seemingly near the preceding, but with larger and more attenuate-pointed leaves, longer-stalked glomerules, and whitish pappus-bristles thickened at the summit.

32. **M. pycnadenia** Robinson (p. 18). Copiously branching herbaceous twiner; branches terete, tawny-tomentellous, very leafy; internodes sometimes 10–12 cm. or at other points scarcely 1 cm. in length; leaves ovate, acuminate, obscurely and remotely denticulate, rounded at base, revolute at margin, 3–6 cm. long, 1.8–2.8 cm. wide 5-nerved almost from the base, thickish, firm, hard, above dull green, minutely puberulent, beneath strongly reticulated, slightly paler, pubescent and closely punctate with reddish-orange glands; petiole terete, about 4 mm. long, fulvous-tomentellous; corymbs convex, compound, trichotomous, the ultimate divisions dense, conspicuously bracteate; bracts ovate, herbaceous, sessile, about 8 mm. long; bractlets similar but smaller; heads sessile, for the most part in 3's; involucral scales narrowly oblong, rounded at tip, firm, puberulent and glanduliferous on the back, 6.5 mm. long, 1.4 mm. wide; corollas about 4.5 mm. long; proper tube at first scarcely differentiated from the slightly funnel-formed throat; teeth broadly deltoid, 0.5 mm. long, obscurely hispidulous; achenes about 4.3 mm. long, pale, puberulent; **pappus-bristles as many as 65, fulvous.**

LORETO: in mountains of Tarapoto, *Spruce* (without number, K., phot. and fragm. Gr.).

33. **M. cordifolia** (L. f.) Willd. Sp. Pl. iii. 1746 (1804). *Cacalia cordifolia* L. f. Suppl. 351 (1781). *M. mollis* HBK. Nov. Gen. et Spec. iv. 135 (1820).—Branches hexagonal, usually puberulent to tomentellous, the angles riblike, not winged; leaves ovate, acuminate, cordate, nearly smooth, entire to undulate-dentate. For further characters see p. 41.

PIURA: in temperate region on banks of the Guancabamba, *Humboldt & Bonpland*, no. 3532 (Par., phot. Gr.); *Townsend*, no. A 173 (Field Mus.).

PUNO: in bushy places between Sandia and Tambo Azalaya (on the way from Sandia to Chunchusmayo), alt. 1500–2000 m., *Weberbauer*, no. 1063 (Brl., phot. and fragm. Gr.).

[Widely distrib. in trop. and subtrop. Am.]

34. **M. microptera** DC. Slender, probably twining, puberulent; stem and especially the branches distinctly hexagonal, brown, at first puberulent, the angles very narrowly herbaceous-winged; leaves ovate, acuminate, subentire to distinctly mucronate-denticulate, broadly cordate or nearly rounded at base, membranaceous, about 5-nerved from the very base, almost smooth, 5–10 cm. long, three-fourths as wide; petiole slender, 1–2.5 cm. long; panicle large, ovoid, brachiate, the widely spreading branches naked to the moderately dense small and rounded corymbs at their tips; heads about 7 mm. long, short-pedicelled; involucral scales brownish-substramineous, oblong, obtuse to subacute; achenes 1.8 mm. long; pappus-bristles about 55, barbellate, capillary, not thickened upward, flesh-colored (in age).—Prod. v. 196 (1836). *M. scandens*, var. *microptera* (HBK.) Bak. in Mart. Fl. Bras. vi. pt. 2, 250 (1876).

PERU? "ex coll. Poeppig" acc. to De Candolle.

[Bahia, Braz., Boliv.]

35. **M. micrantha** HBK. Nov. Gen. et Spec. iv. 134 (1820). *M. scandens* of auth. not (L.) Willd. *M. variabilis* Meyen & Walp. Nov. Act. Nat. Cur. xix. Suppl. 1, 257 (1843).—Slender subherbaceous twiner with subterete stems; leaves triangular-ovate, cordate or hastate, subentire to conspicuously crenate or undulate-dentate; heads small, somewhat cymosely disposed; flowers white. For further characters see p. 41.

PIURA: *Townsend*, no. 791 (Field Mus.), a tomentellous form.

LIMA: about city of Lima, *Gaudichaud* (Gr.); *Wilkes Exped.* (Gr., U. S., N. Y.).

ANCACHS: in woods near river, alt. 1000–1400 m., Caracha on the way from Supe to Ochros, *Weberbauer*, no. 2638 (Brl., phot. and fragm. Gr.).

[Widely distrib. in trop. and subtrop. Am.]

Vernacular name *camotillo* (Weberbauer).

Forma **hirsuta** (Hieron.) Robinson (see p. 43). Villous-hirsute; leaves often large, sometimes as much as 12 cm. long.—*M. scandens*, var. *villosa* Hieron. in Engl. Bot. Jahrb. xxxvi. 473 (1905).

CAJAMARCA: near Tambillo, *von Jelski*, nos. 600, 640, 641, and 695, acc. to Hieron. l. c. (fragm. of nos. 640 and 641 ex hb. Brl. in hb. Gr.).

[Colomb.]

This large-leaved hairy Peruvian plant closely matches the plant of Colombia collected by Hartweg (no. 1111), which was doubtfully

referred to *M. suaveolens* by Bentham, Pl. Hartw. 201. Its leaves are somewhat larger and pubescence rather longer than in *M. scandens*, var. *hirsuta* Hieron. in Engl. Bot. Jahrb. xix. 47 (1894), but it is confidently believed by the writer to be only a phase of the same plant, especially as much variation in pubescence and luxuriance has been observed in other specimens examined.

36. **M. crassifolia** Hieron. Half-shrubby twiner; stems round, multicostulate (after drying), brownish, papillate-scabrid, fistulose; internodes sometimes nearly 3 dm. long; leaves broadly ovate, cuspidate, acuminate, entire or with a few remote and inconspicuous teeth, acuminately decurrent on the petiole from a somewhat rounded base, 8–14 cm. long, 4–9 cm. wide, subpinnately 5–7-nerved from near the base, slightly fleshy, glabrous, a little paler beneath; nerves thick, somewhat exserted beneath, impressed above; petioles 2–4 cm. long; stipules large, connate, subentire or dentate, sometimes 1.5 cm. wide and 6 mm. high; panicled corymbs strongly convex or even ovoid, puberulent; bracts ovate, petiolate; pedicels mostly 2–3 mm. long, puberulent; the bracteole borne near the summit, lance-linear, 6–8 mm. long, acutish; heads 12–14 mm. long; involucral-scales oblong-lanceolate, subherbaceous, narrowed to an obtusish apex, 8–9 mm. long, multistriate, the margin thin, marcescent, sometimes purple-tinged toward the tip; corollas dark-violet, 9 mm. long; the proper tube 3–4 mm. long, gradually enlarged into the throat; teeth 2–2.5 mm. long, oblong; achenes (still immature) 5 mm. long, slightly hispidulous on the angles; pappus-bristles numerous, 125–150, buff, not thickened upward.—Hieron. in Engl. Bot. Jahrb. xxxvi. 471 (1905).

CAJAMARCA: near Tambillo, *von Jelski*, no. 696 (Brl., fragm. Gr.).

With its large dark-colored flowers and smoothish somewhat fleshy foliage this must be a striking species. It is here referred, as by Prof. Hieronymus to Ser. *Corymbosae* but perhaps it might with equal appropriateness be placed among the *Thyrsigerae*.

37. **M. carnosa** Muschler. Twining shrub; stem subterete, when dried becoming sulcate-striate, quickly and completely glabrate except for some obscure puberulence about the nodes; branches and branchlets somewhat hexagonal, quickly glabrate; leaves ovate-lanceolate, gradually narrowed from below the middle to a subobtuse or acutish apex, rather inconspicuously crenate-serrate from below the middle nearly to the tip (teeth about 0.5 mm. high, 2–4 mm. wide, somewhat callous-mucronulate), subpinnately 5-nerved nearly from the entire and cuneately narrowed base, above glabrous and minutely reticulate-

veiny, beneath crisped-puberulent and grandular, 2–3.5 cm. long, 1–2 cm. wide; petiole 5–10 mm. long, without stipule-like appendages; corymbs terminal on the branches, compound, dense, flattish, 1.5–6 cm. or more in diameter, soon nearly glabrate; bractlets lance-oblong, 4–5 mm. long; pedicels 2–5 mm. long; involucral scales lance-linear, attenuate, 7–8.5 mm. long; corollas pale-yellow, glabrous; proper tube slender, 2.5–3.5 mm. long; throat turbinate, about 1 mm. long; teeth oblong, 1.7 mm. in length, 0.7 mm. wide; achenes 3.5–4 mm. long, glabrous, grayish, with lighter-colored angles; pappus-bristles about 80, yellowish-white, slightly scabrid, not thickened upward.—Muschler in Engl. Bot. Jahrb. l., Beibl. 111, p. 76 (1913).

AYACUCHO: Prov. Huanta: on road between Tambo and Osno, on the Aburimac River, in shrubby places, alt. 2700–3000 m., *Weberbauer*, no. 5645 (Brl., fragm. in hb. Gr.).

Thanks to the kindness of Prof. L. Diels, Director of the Botanical Garden at Berlin-Dahlem, the writer has been supplied with a liberal fraction of the type-material of this species. It has accordingly been possible to draw a new description for it. This will be found to agree in general features with the original diagnosis, but to differ considerably in some of the measurements. Prof. Diels has kindly had the data relative to the locality and habitat verified by a re-examination of the original label of Dr. Weberbauer.

DOUBTFUL, TRANSFERRED, OR EXCLUDED SPECIES.

M. armigera Poepp. in Poepp. & Endl. Nov. Gen. ac Spec. iii. 52 (1845) = M. LAXA DC. (see p. 79).

M. amara, var. *Guaco* (H. & B.) Bak. in Mart. Fl. Bras. vi. pt. 2, 237 (1876) = M. GUACO H. & B. (see p. 88).

M. attenuata DC. Prod. v. 195 (1836) is doubtfully referred to M. GUACO H. & B. (see p. 88).

M. cuneata Sch.-Bip. Bonplandia, iv. 54 (1856), without description; Bak. in Mart. Fl. Bras. vi. pt. 2, 238 (1876), where referred to synonymy and treated as identical with M. GUACO H. & B. (see p. 88).

M. cuterrensis Hieron. in Engl. Bot. Jahrb. xxxvi. 473 (1905) was later transferred to KANIMIA by Hieronymus himself in Engl. Bot. Jahrb. xl. 394 (1908).

M. Lechleri Sch.-Bip. l. c. is a nomen nudum, founded on Lechler's no. 2480.

M. LEIOSTACHYA Benth. Pl. Hartw. 201 (1845). The range of this species was by Hemsley, Biol. Cent.-Am. Bot. ii. 103 (1881), extended to Peru, but it has proved impossible to locate, either at Kew or elsewhere, any Peruvian material to substantiate this record. It is therefore inferred that Hemsley was interpreting the plant in a broad way and including material of similar habit here referred to other species.

M. LLOENSIS Hieron. (see p. 49). An immature inflorescence of this species lent to the writer from the Botanical Museum in Copenhagen is labeled "72 Née. 997 Peru." Née travelled in Ecuador as well as Peru, and these adjacent countries were at that period not very sharply distinguished by European writers. Furthermore, there is said to have been confusion in the marking of some packages in the collection of Née, leading to uncertainty as to their geographical source. Under these circumstances, it seems probable that the specimen actually was secured in Ecuador. At all events, it is not a satisfactory basis for the inclusion of this species in the flora of Peru.

M. mollis HBK. Nov. Gen. et Spec. iv. 135 (1820) appears to be merely a very pubescent form of M. CORDIFOLIA (L. f.) Willd. (see p. 91).

M. pellucidivenia Hieron. in Engl. Bot. Jahrb. xxxvi. 474 (1905) is believed to be conspecific with M. HAENKEANA DC. (see p. 81).

M. SALVIAEFOLIA Gardn. in Hook. Lond. Journ. v. 487 (1846). To this Brazilian species Baker in Mart. Fl. Bras. vi. pt. 2, 255 (1876) doubtfully and incorrectly reduced the Peruvian *M. armigera* Poepp., which as above stated has proved inseparable from the earlier M. LAXA DC.

M. scandens of authors as to Peruvian specimens is chiefly M. MICRANTHA HBK. (see p. 92).

M. TAFALLANA HBK. Nov. Gen. et Spec. iv. 137 (1836), originally published as from Peru, came from near Guayaquil in what is now Ecuador.

M. tenax Sch.-Bip. l. c. is a nomen nudum, founded on Lechler's no. 2355.

M. variabilis Meyen & Walp. Nov. Act. Nat. Cur. xix. Suppl. 1, 257 (1843) is M. MICRANTHA HBK. (see p. 92).

BOLIVIA.

The more important references to the Mikanias of Bolivia are as follows:

1865–66. Schultz-Bipontinus, Bull. Soc. Fr. xii. 82, & Linnaea, xxxiv. 535–536, lists as Mikanias 5 species collected by Mandon about Mt. Sorata. Of these, four were named as new but none was characterized. Two of these supposed new species, namely *M. Cumingii* and *M. Mandonii*, have since been referred to the genus *Ophryosporus*.

1892. Britton, Bulletin Torr. Bot. Club, xix. 1–2, chiefly on the basis of collections by Dr. H. H. Rusby, enumerates 8 species of *Mikania* from Bolivia.

1893. Rusby, Mem. Torr. Bot. Club, iii. no. 3, 53, describes (under the since abandoned name *Willoughbya*) a new Bolivian *Mikania* and records the Bolivian occurrence of two others.

1895. Rusby, Mem. Torr. Bot. Club, iv. 211, mentions the Bolivian occurrence of *M. micrantha* (also under the name of *Willoughbya*).

1896. Rusby, Mem. Torr. Bot. Club, vi. 58–59, under the generic name *Willoughbya* describes three new Bolivian members of the genus and gives further records of the Bolivian occurrence of four others.

1907. Rusby, Bull. N. Y. Bot. Gard. iv. 381–383 (still under the name *Willoughbya*) lists 11 Bolivian species of the genus, 3 of these being characterized as new.

1908. Hieronymus in Engl. Bot. Jahrb. xl. 390, describes *M. Fiebrigii* from southern Bolivia.

1909. Lingelsheim in Fedde, Rep. vii. 250–51, characterizes as new three Bolivian Mikanias collected by Buchtien.

1910. Buchtien, Contrib. Fl. Boliv. pt. 1, 190, enumerates, on the basis of his own collecting, 10 species of *Mikania* from Bolivia.

1912. Rusby, Bull. N. Y. Bot. Gard. viii. 127, describes as new two more species of *Mikania* from Bolivia, based upon plants collected by Mr. R. S. Williams.

It will be seen that the Mikanias of Bolivia have at no time received any monographic attention. They never have been revised, keyed, or even catalogued except as they happen to have been present in some particular collection. Dr. Rusby's paper of 1907, giving what is the most extended list of Bolivian Mikanias, includes only eleven species of this group—a number which may now be raised to twenty-eight.

Ser. I. Spiciformes DC (see p. 27).

Key to Species.

Heads at maturity 8–10 mm. long
  Spikes rather loose, 3–10 cm. long; leaves elliptic-oblong, scabrous above.....1. *M. psilostachya.*
  Spikes dense, capitiform, 1–2 cm. long; leaves broadly ovate, glabrous above.....13. *M. platyphylla.*
Heads even when fully mature about 5 mm. long; spikes loose; leaves glabrous above.....2. *M. dioscoreoides.*

1. **M. psilostachya** DC. Foliage harsh, rough and somewhat rigid, the veins commonly somewhat depressed on the upper leaf-surface.—Prod. v. 190 (1836); Britton, Bull. Torr. Bot. Club, xix. 1 (1892); Buchtien, Contrib. Fl. Boliv. pt. 1, 190 (1910). *Willoughbya psilostachya* (DC.) Ktze. Rev. Gen. i. 372 (1892); Rusby, Mem. Torr. Bot. Club, vi. 58 (1896), & Bull. N. Y. Bot. Gard. iv. 381 (1907).

La Paz: Prov. Yungas, alt. 1830 m., *Rusby*, no. 1702 (N. Y.); Coripati, *Bang*, no. 2148 (Gr. N. Y., U. S., Mo., Philad., Field Mus.). Prov. Larecaja: alt. 763 m., Mapiri, *Rusby*, nos. 1701 (Gr., N. Y., U. S., Mo., Philad., Field Mus.), 1703 (N. Y.); Tipuani-Guanai, *Bang*, no. 1730 (Gr., N. Y., U. S., Mo., Philad., Field. Mus.); San Carlos, alt. 750 m., *Buchtien*, no. 991, acc. to Buchtien, l. c. Prov. Caupolican: alt. 550 m., Tumupasa, *R. S. Williams*, nos. 406 (N. Y.), 423 (N. Y.).

Santa Cruz: Prov. Sara: Buena Vista, alt. 500 m., *Steinbach*, nos. 5169 (Arn. Arb.), 5232 (Arn. Arb.).

[Peru, Colomb., Guian., Braz.]

2. **M. dioscoreoides** (Rusby), comb. nov. Tall twiner; branches subterete, in dried state striate-costulate, brownish, at first puberulent, soon essentially glabrate; internodes 9–12 or more cm. long; leaves ovate-oblong, acuminate or narrowed to a prolonged cuspidate tip, entire, rounded or in varying degree pointed at base, 8–20 cm. long, about half as wide, glabrous, pale or after drying dark-green, with a fine and somewhat raised reticulation on both surfaces, chartaceo-coriaceous, above slightly shining, beneath a little paler and dull, pinnately 5(–7)-nerved from near (within 6–22 mm. of) the base, the nerves connected by numerous transverse roughly parallel though somewhat irregular veins; petiole about 3 cm. long; panicle large, sometimes 4 dm. or more in length and 2.8 dm. in diameter, its divisions nearly divaricate, dividing again into those of the secondary and tertiary order, puberulent; bracts ovate-oblong to lanceolate, mostly 3–5 cm. long, 1.3–2 cm. wide; bractlets small, subulate; heads small for the genus, 4–5 mm. long, closely sessile; involucral scales about 3 mm. long, 1 mm. wide, nearly smooth; corollas about 2.5 mm. long, glabrous; proper tube 1.3 mm. long; slightly enlarged throat about 0.9 mm. long; teeth deltoid, scarcely 0.4 mm. long; achenes (not

fully mature) 1.2 mm. long; pappus-bristles about 30, white.—*Willoughbya dioscoreoides* Rusby, Mem. Torr. Bot. Club, vi. 58 (1896). ? *Mikania cinnamomifolia* Lingelsheim in Fedde, Rep. vii. 251 (1909); Buchtien, Contrib. Fl. Boliv. i. 190 (1910).

Cochabamba: Prov. Chapare: near the town of Cochabamba, *Bang*, no. 1256 (Gr., N. Y., U. S., Mo., Philad., Field Mus.); Espirito Santo, in tropical region, alt. 750 m., *Buchtien*, no. 2247 (Gr.).

? La Paz: Prov. Larecaja: San Carlos near Mapiri, alt. 750 m., *Buchtien*, nos. 1398, 1508 (type material of *M. cinnamomifolia*).

No authentic material of *M. cinnamomifolia* has been available for examination. It is here provisionally and with some doubt referred to *M. dioscoreoides* since in all described features it bears a very close resemblance to this species. The slight differences of measurement, etc., are such as to have little significance.

Ser. II. Racemosae (see p. 30).

Key to Species.

Involucral scales (about 5 mm. long) tawny-tomentellous on the back; leaves harshly coriaceous, scabrous on upper surface. Here may be sought forms which, though having somewhat pedicellate heads, clearly belong to.....1. *M. psilostachya*.
Involucral scales (about 4 mm. long) nearly or quite glabrous; leaves chartaceo-membranaceous, not scabrous above.....3. *M. decora*.

3. **M. decora** Poepp. Slender shrubby twiner, at first puberulent, soon nearly smooth; leaves ovate-oblong, acuminate, rounded at base; firmly membranaceous; panicle large, lax, its ultimate divisions somewhat irregularly racemiform.—Poepp. in Poepp. & Endl. Nov. Gen. ac Spec. iii. 53 (1845). *Willoughbya Bangii* Rusby, Mem. Torr. Club, iii. pt. 3, 53 (1893). For a more detailed description see p. 76 of this paper.

La Paz: Yungas, *Bang*, nos. 523 (Gr., N. Y., Philad., Field. Mus.), 639a (N. Y.).

Ser. III. Thyrsigerae (see p. 32).

Key to Species.

a. Heads (or at least most of them) distinctly pedicelled *b*.
b. Leaves not angled at the sides *c*.
c. Leaves pointed or rounded but not cordate at base *d*.
d. Head loosely subracemose on ultimate branches of the panicle; leaves rounded at base ..... 3. *M. decora*.

d. Heads in rather dense cymose glomerules, not in the least racemose *e*.
e. Leaves elliptic-ovate, the finely reticulated veins raised on the upper surface.....4. *M. eucosma.*
e. Leaves rhombic-ovate to lance-oblong; veins depressed above.....5. *M. baccharoidea.*
c. Leaves (at least the mature cauline) cordate at base *f*.
f. Stipuliform appendages at base of petiole none or slight and inconspicuous *g*.
g. Involucral scales stramineous, glabrous to thinly villous *h*.
h. Stem permanently invested in a thick densely matted woolly sheath; leaves canescent-sericeous beneath.....6. *M. lanuginosa.*
h. Stem tawny-villous to nearly glabrous; leaves never canescent-sericeous beneath.....7. *M. ferruginea.*
g. Invlucral scales herbaceous, tomentellous.....8. *M. Rusbyi.*
f. Petioles expanded at base into large stipule-like appendages.....14. *M. leucophylla.*
b. Leaves ovate or somewhat deltoid with a conspicuous angle or sharp lobe on one or both sides of the deeply cordate to subtruncate base *i*.
i. Leaves with a slightly raised reticulation on both surfaces, usually thickish and rather firm.....7. *M. ferruginea.*
i. Leaves without conspicuous or elevated reticulation, membranaceous or nearly so *j*.
j. Corolla-teeth not much exceeding the throat; leaves (5–10 cm. or more in width) at maturity nearly smooth beneath.....9. *M. punctata.*
j. Corolla-teeth several times as long as the obsolescent throat; leaves (3–5 cm. wide) densely gray-tomentellous beneath.....10. *M. Buchtienii.*
a. Heads sessile *k*.
k. Leaves cordate at base, ovate *l*.
l. Petiole not a quarter as long as the blade.....7. *M. ferruginea.*
l. Petiole more than half as long as the blade.....11. *M. Haenkeana.*
k. Leaves rounded or more often somewhat pointed at base *m*.
m. Leaves lance-oblong, feather-veined; stem pruinose-puberulent.....12. *M. longiacuminata.*
m. Leaves broadly ovate; stem soon glabrate.....13. *M. platyphylla.*

4. **M. eucosma** Robinson (p. 9). Slender, very smooth, slightly ligneous; leaves elliptical-ovate, acuminate to an obtuse tip, entire, slightly pointed at base, coriaceous, 5(–7)-ribbed essentially from the base, finely reticulated on both surfaces, 7–9 cm. long, half as wide; petiole slender, flexuous, about 2 cm. long; panicle terminal, 3 dm. long, 1–1.5 dm. thick, rather open, leafy-bracted; bractlets ovate-lanceolate, 1.5 mm. long; heads 5–6 mm. long, short-pedicelled, in rather close cyme-like clusters; involucral scales oblong, obtuse, about 3.5 mm. long callous-thickened and slightly connate at the somewhat narrowed base; corollas about 3.5 mm. long; the proper tube 1 mm. long; throat subcylindric, 2 mm. long; teeth short; achenes

pale, 2.7 mm. long, slightly puberulent between the ribs; pappus-bristles about 50, whitish, perceptibly scabrid, not thickened at the tip.—*M. Lindbergii* Britton, Bull. Torr. Bot. Club, xix. 1 (1892), not Bak.

La Paz: Yungas, alt. 1830 m., *Rusby*, no. 1736 (N. Y., phot. and fragm Gr.).

5. **M. baccharoidea** Rusby. Climbing and much branched shrub, branches leafy, subterete, brownish, woody, with small white pith; their surface at first covered by a short spreading sordid puberulence; leaves ovate, 2.5–4.5(–8) cm. long, 1.5–2.5(–3.5) cm. wide, entire or bearing one or two blunt teeth on each side, narrowed or subacuminate to a rounded apex, revolute at the margin, coriaceous, pinnately 5-nerved from near the obtusish base, glabrous and slightly lucid on both surfaces; first pair of lateral nerves small, submarginal, second pair prominent, leaving the midrib 3–5 mm. above the base; veinlets slightly impressed above, scarcely exserted beneath; petiole slender, 3–7 mm. long; panicles terminal on the branches, pyramidal, very leafy, the divisions spreading-ascending, rather densely sordid-puberulent; heads about 6 mm. long, subsessile or most of them perceptibly pedicelled in rounded clusters; bractlets very small; involucral scales narrowly oblong, brownish, obtusish, puberulent, about 2.5 mm. long; corollas white, 3 mm. long, glabrous; proper tube 1.3 mm. long; narrowly campanulate throat 1 mm. long; teeth triangular, 0.7 mm. long; ripe achenes blackish, 2.7 mm. long, gland-sprinkled between the ribs; pappus-bristles about 30, white, not noticeably thickened at tip.—**Bull. N. Y. Bot. Gard. viii. 127 (1912).**

Dept. not ascertained: Cargadira, alt. 2440 m., *R. S. Williams*, no. 1604 (N. Y., phot. and fragm. Gr.).

To this species may be doubtfully referred Bang's no. 2884 (Gr., N. Y., Field Mus., Mo., U. S., Philad.), immature material, reported by Rusby, Bull. N. Y. Bot. Gard. iv. 381 (1907), as *Willoughbya trinerris* (H. & A.) Rusby, under the impression that it was identical with the southern Brazilian *Mikania trinerris* H. & A. The latter species, however, has larger, more elliptic-ovate, slightly thinner and more chartaceo-coriaceous leaves which are 5-nerved almost from the very base and which assume a different olive-brown shade in drying.

Although these differences are not strong singly, they indicate in combination that the Bolivian and Brazilian plants are probably distinct. On the other hand, Bang's immature no. 2884 corresponds

closely with the Bolivian *M. baccharoidea* except in having slightly larger and smoother leaves.

6. **M. lanuginosa** DC. A stoutish twiner notable for its thick dense white silky-woolly indument.—Prod. v. 201 (1836). *Willoughbya lanuginosa* (DC.) Rev. Gen. i. 372 (1891); Rusby, Bull. N. Y. Bot. Gard. iv. 381 (1907). For char., synon., etc., see p. 35 of present paper.

LA PAZ: Prov. Caupolican: Tumupasa, alt. 550 m., *R. S. Williams*, no. 551 (N. Y., phot. Gr.).

DEPT. NOT INDICATED: without locality, date, or number, *Bang* (N. Y.).

[Venez., Colomb., Peru., Braz.]

7. **M. ferruginea** Rusby. Vigorous twiner, 3–4 m. high, more or less woody; stem terete, after drying sulcate-costulate, spreading tawny-villous to subsetose or in varying degree glabrate, yellowish-brown to deep purple; internodes 5–10 cm. long; leaves mostly long-ovate, acute to caudate-acuminate, quite entire to (at least the lower) sometimes coarsely dentate or occasionally bearing a single angle or short sharpish lobe on one or both sides, green and reticulate-veiny on both surfaces, 5–28 cm. long, 3.8–20 cm. wide, cordate by a shallow or a deeper and narrow or sometimes by an open and rounded sinus, pinnately 5-nerved, appressed tawny-villous on both surfaces, sometimes quite glabrate above; petioles 1–2 cm. long, densely spreading-hirsute with tawny bristles; panicles terminal, 3 dm. long or more, half as thick, pubescent, leafy-bracted; bractlets stramineous, ovate- or lance-oblong; heads about 7 mm. long, sessile by 3's or in varying degree raised singly on pedicels 1–3 mm. long; involucral scales oblong, pale or brownish-stramineous, striate, subacute at the often marcescent tip, nearly smooth dorsally, 5–6 mm. long, 1.6 mm. wide; corollas white, glabrous; proper tube 1.5 mm. long; throat broadly campanulate, of equal length; teeth deltoid, 0.8 mm. long; achenes 2.7 mm. long, gray, nearly smooth, with lighter-colored angles, somewhat tapering toward the base, perceptibly constricted just below the pappus-bearing disk; pappus-bristles about 40, scabrid, scarcely thickened at tip.—Rusby ex Buchtien, Contrib. Fl. Boliv. i. 190 (1910), where mentioned without char. or synon. but intended to apply to the same plant as *Willoughbya ferruginea* Rusby, Mem. Torr. Bot. Club, vi. 58 (1896). *W. hirsutissima* Rusby, l. c. & Bull. N. Y. Bot. Gard. iv. 381 (1907), not Ktze. ? *Mikania hirsutissima* Buchtien, Contrib. Fl. Boliv. i. 190 (1910), not DC.

LA PAZ: Prov. Larecaja: Guanai-Tipuanai, *Bang*, nos. 1331 (Gr., N. Y., U. S., Mo., Philad., Field Mus.), 1419 (Gr., N. Y., Mo., Philad., Field Mus.);

alt. 750 m., San Carlos, *Buchtien*, acc. to Buchtien, l. c. Prov. Nor Yungas: Calapampa, *Bang*, no. 2326 (Gr., N. Y., U. S., Mo., Philad., Field Mus.); Coroico, *Holway* (Gr.); Hacienda "Anacuri," *Holway* (Gr.).

SANTA CRUZ: Prov. Chiquitos: Santa Cruz, *Pearce* (K.).

WITHOUT LOCALITY: *Bang*, no. 2883 (Gr., U. S., Mo., K., Philad.).

8. **M. Rusbyi** Robinson (see p. 18). Slightly lignescent twiner with solid terete densely fulvous-tomentose stems; internodes 7–12 cm. long or more; leaves ovate, 11–17 cm. long, about half as broad, membranaceous or nearly so, gradually tapering to the tip, entire or inconspicuously cuspidate-denticulate, above green and finely pubescent, beneath densely fulvous-tomentose, cordate or (the upper merely rounded at base, pinnately 5-nerved; petiole 2–3 cm. long, tawny-tomentose; panicle 2.5–4 dm. long, 9–15 cm. thick, leafy-bracted; bractlets small, lance-linear, the ultimate scarcely 2 mm. long; heads 1 cm. long, somewhat cymosely disposed; pedicels 1–5 mm. long; involucral scales obovate-elliptical, rounded at tip, 5 mm. long, 2.5 mm. wide, tawny-tomentose; corollas 5–6 mm. long, slightly hairy; the proper tube 2 mm. long; throat campanulate, 3 mm. high; teeth triangular, 0.8 mm. long; achenes brown, 4 mm. long, smooth, tapering downward; pappus-bristles about 30, yellowish-white.—*M. rufa* Britton, Bull. Torr. Bot. Club, xix. 2 (1892), not Benth.

LA PAZ: Prov. Nor Yungas: Unduavi, alt. 2440 m., *Rusby*, no. 1737 (N. Y., phot. and fragm. Gr.); *Buchtien*, alt. 3300 m., no. 3044 (N. Y.).

9. **M. punctata** Klatt. Tall, weak-stemmed twiner; leaves oval to deltoid, caudate-acuminate, the cauline cordate by an open sinus and bearing at each side an acuminate spreading lobe.—Bull. Soc. Bot. Belg. xxxi. 195 ("1892." [1893]). *M. boliviensis* Lingelsheim in Fedde, Rep. vii. 251 (1909); Buchtien, Contrib. Fl. Boliv. 190 (1910); not Sch.-Bip. For further char. and synon. see p. 33 of this paper.

LA PAZ: Prov. Larecaja: San Carlos near Mapiri, alt. 750 m., *Buchtien*, nos. 1553 (N. Y.), 71 (Gr., N. Y., Field Mus.).

[Colomb., Venez., Cent.-Am., S. Mex.]

The Bolivian plant, described as *M. boliviensis* by Lingelsheim, corresponds with the more northern material from Colombia and Central America even in exceedingly small details. The only point of difference thus far detected lies in the fact that while the more northern material has the heads mostly subsessile, they are in the Bolivian material borne on pedicels from 0.5–3 mm. long. It is well known that the distinction between subsessile and shortly pedicelled has little classificatory value. It is certainly far too slight to warrant

specific separation of plants which agree closely in all other observed details.

10. **M. Buchtienii** Robinson (see p. 7). Rather slender, twining, probably herbaceous; stem at first hexagonal and covered with a crisped tawny short tomentum, at length nearly terete, fistulous; leaves deltoid-hastate, acuminate, nearly entire, 5–6.5 cm. long, 3.7–4.5 cm. wide, submembranceous, 3(–5)-nerved from the subtruncate or shallowly cordate base, above green and rusty tomentellous on the nerves, beneath gray-velvety; petiole 2–3 cm. long, slender, tawny-tomentellous; panicles terminal and lateral, 1.5–2.5 dm. long, 1–1.6 dm. thick, leafy-bracted, rather loose, tawny- or rusty-tomentellous; pedicels 2–5 mm. long, bracteolate at summit; bracteoles lanceolate, acute, 2.5–3 mm. long; involucral scales oblong, obtuse or rounded at summit, ciliolate, nearly smooth dorsally, brownish, 4.5 mm. long, 0.8–1.6 mm. wide; corollas glabrous, slender; proper tube 3.5 mm. long, curved; throat almost none; teeth spreading, lanceolate, 1.5 mm. long; achenes glabrous, 2.8 mm. long, dark with lighter-colored angles; pappus-bristles about 40, scarcely roughened, slightly carneous, about 5 mm. long.

La Paz: Prov. Nor Yungas: Polo-Polo, near Coroico, alt. 1100 m., *Dr. Otto Buchtien*, nos. 3935 (type, N. Y., phot. and fragm. Gr.), and 3936 (N. Y., phot. Gr.).

11. **M. Haenkeana** DC. Subherbaceous slender twiner with long-petioled round-ovate deeply cordate membranaceous leaves and sessile densely crowded subspicately paniculate heads.—Prod. v. 196 (1836). *Willoughbya odorata* Rusby, Bull. N. Y. Bot. Gard. iv. 381 (1907), not, however, from character *M. odorata* Lehm. Hamb. Gartenz. v. 369 (1849), which (thought to be Mexican) was described as having pedicelled many-flowered heads, fistulose stem, and ecordate leaves. For further char. and synon. of *M. Haenkeana* see p. 81 of the present paper.

La Paz: Calapampa, Prov. Yungas, *Bang*, no. 2339 (Gr., N. Y., U. S., Mo., Philad., Field Mus.)
[Peru.]

12. **M. longiacuminata** Rusby. Stem subterete, densely fulvous-tomentellous; pith white; internodes 5–7 cm. long, attaining 6 mm. or more in diameter; leaves ovate-lanceolate, gradually attenuate to a sharp tip, slightly undulate or entire, about 12 cm. long and 4 cm. wide, rounded at base, above glabrous, beneath grayish-tomentellous, reticulate-veiny, pinnately nerved; first pair of nerves leaving the

midrib about 3 mm., the second about 7 mm., and the third (the most prominent) about 20–25 mm. above the base; petioles 1.5–2 cm. long, those of the same pair connected by a transverse ridge; panicles large, terminal, ovoid, 2–3.5 dm. high, 1.5–2 dm. thick, leafy-bracted, with spreading-ascending opposite pedunculate conical-ovoid divisions; secondary bracts lance-linear, subpetiolate; heads (immature) sessile; bractlets suborbicular, 1.4 mm. in diameter; involucral scales broadly oblong or subobovate, about, 3 mm. long and half as wide, brownish-green, striatulate, smooth; corollas (very immature) apparently smooth and with teeth unusually long and narrow in proportion to the tube and throat.—Rusby in sched. pl. Bang. and ex Buchtien, Contrib. Fl. Boliv. i. 190 (1910), without char. or synon. but doubtless referring to *Willoughbya longiacuminata* Rusby, Mem. Torr. Bot. Club, vi. 59 (1896), where described.

La Paz: Prov. Larecaja: Mapiri, *Bang*, no. 1504 (Gr., N. Y., Mo., Philad. Field Mus.); Charopampa, alt. 750 m., according to Buchtien, l. c.

13. **M. platyphylla** DC. Climbing shrub (Poeppig), obscurely puberulent on inflorescence and petioles, otherwise glabrous; leaves ovate-oblong, rhombic-ovate, or suborbicular, acuminate; heads sessile in panicled spiciform glomerules.—Prod. v. 195 (1836). *M. Hookeriana* DC. l. c. ? Britton, Bull. Torr. Bot. Club, xix. 2 (1892). For further char. and synon. see p. 83 of the present paper.

La Paz: Prov. Larecaja: alt. 1525 m., Mapiri, *Rusby*, no. 1738 (N. Y., phot. Gr.).

[Peru; Brit. Guian.?]

M. Hookeriana DC. of British Guiana is a very closely related if not actually identical plant, sharing all the more important characters of this species. Proof of their full identity must await more copious material.

Ser. IV. Corymbosae (see p. 39).

Key to Species.

a. Stipuliform appendages large, membranaceous *b*.
  b. Leaves subentire; inflorescence glabrous.....14. *M. leucophylla*.
  b. Leaves incisely many-toothed; inflorescence pubescent 15. *M. Fiebrigii*.
a. Stipuliform appendages none (petioles sometimes slightly broadened at base and often connected by a transverse ridge) *c*.
  c. Leaves 3–5-foliolate.....16. *M. trifolia*.
  c. Leaves simple *d*.

d. Erect perennial herb; leaves deltoid, subsessile. . . .17. *M. officinalis.*
d. Twiners; leaves decidedly petioled *e*.
e. Leaf-blade broadly ovate or elliptic, pointed at base and somewhat cuneately decurrent on the petiole *f*.
f. Leaves very smooth and somewhat glossy above; heads (not noticeably ternate) in small dense terminal corymbiform glomerules in very open divaricately branched panicle. . . . . .18. *M. rubella.*
f. Leaves dull and more or less papillo-scabrid above; heads (mostly ternate) in large rounded compound corymbs *g*.
g. Lower surface of leaf smoothish or merely papillose or puberulent, not conspicuously reticulated. . . . . .19. *M. guaco.*
g. Lower surface of leaf densely grayish-tomentose and reticulate-veiny. . . . . .20. *M. speciosa.*
e. Leaf-blade rounded, subtruncate or cordate at base, not conspicuously decurrent upon the petiole *h*.
h. Branches distinctly hexagonal *i*.
i. Angles rib-like, not winged. . . . . .21. *M. cordifolia.*
i. Angles subherbaceous, like exceedingly narrow wings. . . . . .22. *M. microptera.*
h. Branches subterete, several–many-ribbed *j*.
j. Flaccid as if somewhat hydrophytic, entirely glabrous; leaves lanceolate from a rounded base, caudate-acuminate. . . . . .23. *M. flaccida.*
j. Mesophytic and more or less pubescent; leaves deltoid or ovate, cordate or hastate *k*.
k. Heads (when mature) fully 12 mm. long. . . .24. *M. longiflora.*
k. Heads 4–8 mm. long *l*.
l. Corolla-teeth deltoid, distinctly shorter than the turbinate-campanulate throat; inflorescence often glomerate-corymbose but when expanded and loose having the terminal cymes much exceeded by the lateral; bracts small, inconspicuous. . . .25. *M. micrantha.*
l. Corolla-teeth ovate to narrowly oblong, equalling or often much exceeding the short throat; inflorescence trichotomous, the central portion somewhat racemiform, not surpassed by the lateral; its bracts herbaceous, conspicuous. . . . . .26. *M. Schultzii.*

14. **M. leucophylla** (Rusby) Robinson. Vigorous but rather slender twiner; stem slightly lignescent (base not seen), terete, glabrous and somewhat glaucous, fistulose; internodes 6–14 cm. long; leaves ovate, caudate-attenuate, undulate and narrowly revolute on the edge, deeply cordate by a narrow sinus, 5(–7)-nerved from the base, 9–13 cm. long, 5–7 cm. wide, above green and glabrous, beneath pale, finely reticulated, the veinlets minutely shaggy with a white scurfiness; petioles 3–5 cm. long, flexuous, expanded at base into brown ovate subconnate appendages (1.5 cm. in breadth); corymbs lateral and terminal, long-stalked, divaricately branched, glabrous; heads

about 15 mm. long, mostly nodding on short slender smooth curved pedicels; bractlets spathulate-linear, about 1.5 mm. long; involucral scales narrowly oblong, about 8 mm. in length, thickened and slightly gibbous at base, smooth except at the obtuse hirtellous tip; corollas glabrous; proper tube slender, 2 mm. long, dark-brown (in dried state); throat relatively large, campanulate, 3 mm. long, yellow (after drying); teeth broadly deltoid, 0.6 mm. long; achenes slender, brown, glabrous, 6 mm. long; pappus-bristles very numerous, more than 100, with a slight reddish tinge, delicately capillary, not thickened at tip.—Proc. Am. Acad. xlvii. 196 (1911). *Willoughbya leucophylla* Rusby, Bull. N. Y. Bot. Gard. iv. 382 (1907).

Bolivia without locality: *Bang*, no. 2241 (Gr., N. Y., U. S., Mo., Philad., Field Mus.).

A beautifully distinct species.

15. **M. Fiebrigii** Hieron. Twining, said to be shrubby; stems terete, at first covered with a pale and slightly glandular pubescence, soon glabrate, in dried state multicostulate, 7–9 mm. in diameter, fistulose; leaves ovate, acuminate, incisely dentate (teeth radially spreading, 1–5 mm. high and wide), deeply cordate with an open sinus, 3(–5)-nerved from an acuminate junction with the petiole, membranaceous, green above, slightly paler beneath, obscurely hirtellous on both surfaces, 9–15 cm. long, 7–10 cm. wide; petioles 3–6 cm. long, slender to the stem, their bases connected by spreading transverse lunate sharply dentate herbaceous stipuliform appendages (1 cm. in radius); inflorescence pubescent, repeatedly divided, the ultimate corymbs 3–7 cm. wide, convex, rather dense; pedicels 1–3 mm. long; bractlets linear; heads 10–12 mm. long; involucral scales about 7 mm. long, oblong, thickened and slightly gibbous at base, hirtellous toward the tip; corollas pale yellowish (after drying), about 6 mm. long; proper tube 2.3 mm. long; throat distinctly enlarged, turbinate-campanulate, 2 mm. long; teeth ovate-lanceolate, 1.8 mm. long; achenes nearly black, about 5.5 mm. long, subterete, the angles represented by thin pale ribs; pappus-bristles about 60, with slight yellowish or carneous cast, scarcely at all thickened toward the summit.—Hieron. in Engl. Bot. Jahrb. xl. 390 (1908). *M. saltensis*, var. *stipulata* Hieron. in herb., a name abandoned before publication by its author, but found on a label and needlessly added to the burden of published synonymy by Muschler in Engl. Bot. Jahrb. l. Beibl. no. 111, p. 77 (1913).

TARIJA: Pinos near the city of Tarija, and near Chiquiaca, alt. 1000–2000 m., *Fiebrig*, no. 3132 (Gr.).

16. **M. trifolia** Sch.-Bip. Slender subherbaceous twiner; stem rusty-puberulent, 3–5 mm. thick; leaves palmately 3-foliolate, 1.6–7 cm. in diameter; leaflets cuneate at base, usually lobed (the lateral cleft nearly to the base, rendering the leaves almost 5-foliolate), membranaceous, green above, paler and punctate beneath; petioles 1.5–3 cm. long, often connected at base by obscure corky lobulate ridges; corymbs rounded, pedunculate, rather dense, 3–5 cm. wide, united to form a terminal leafy-bracted compound inflorescence; pedicels 1–2.5 mm. long; heads about 8 mm. long; involucral scales oblong, acutish, green, puberulent, 7 mm. long, 2 mm. wide, striate; corollas white (Bang), with almost no throat, the proper tube 2.8 mm. long, slender, granulate; the widely spreading teeth linear-oblong, about 1.6 mm. long; achenes dark, granulated on the faces, 3.2 mm. long; pappus-bristles about 55, nearly white.—Bull. Soc. Bot. Fr. xii. 82 (1865), & Linnaea, xxxiv. 535 (1865–66), without descrip. *Willoughbya trifolia* Rusby, Bull. N. Y. Bot. Gard. iv. 382 (1907), where first described.

LA PAZ: Prov. Larecaja: in woods of the temperate region, Quebiguaya, near Sorata, alt. 2800–3000 m., *Mandon*, no. 266 (Gr., N. Y.). Prov. Nor Yungas: forest mould, Coroico, *Bang*, no. 2426 (Gr., N. Y., Mo., Philad.).

17. **M. officinalis** Mart. Erect herbaceous perennial; stems commonly two or more from the same lignescent caudex, subterete to sulcate-angulate, 4–8 dm. high, simple and leafy up to the corymbosely branched compound flattish inflorescence; internodes mostly 2–3 cm. long; leaves deltoid, 1.5–6 cm. long and wide, acute, coarsely few-toothed at the sides, entire toward the abruptly narrowed base, 5(–7)-nerved, thin and submembranaceous to firmly coriaceous and veiny, pale green, glabrous or (toward the margin) strigillose; petiole flattish, at most 3–4 mm. long; corymbs 3–18 cm. in diameter, pubescent; bracts small, lance-linear, acute; pedicels very unequal, 0–3 mm. long; heads 9–10 mm. long; bractlets borne at summit of the pedicel, lanceolate, about 4 mm. long; involucral scales lance-oblong, acute, 7 mm. long, scabrid, brownish-stramineous; corollas 5 mm. long; proper tube about 2.5 mm. long; throat turbinate-subcampanulate, about 2 mm. high; teeth deltoid, acute, 1 mm. long, slightly puberulent; achenes 3.2 mm. long, often 6-ribbed; ribs light-colored; faces dark, granulated; pappus-bristles about 50, whitish.—Reise, i. 283 (1823); Isis, 1824, p. 587 (1824); Bak. in Mart. Fl. Bras. vi. pt. 2, 221, t. 62 (1876). *Cacalia Cor Jesu* Vell. Fl. Flum. (text) 340 (1825),

viii. t. 71 (1827). *M. brachypoda* DC. Prod. v. 201 (1836). *Catophyllum tropaeolifolium* Pohl ex Bak. in Mart. Fl. Bras. vi. pt. 2, 222 (1876). *C. deltoideum* Pohl ex Bak. l. c. *Eupatorium officinale* (Mart.) Baill. Dict. ii. 748 (1886). *Willoughbya officinalis* (Mart.) Ktze. Rev. Gen. i. 372 (1891); Rusby, Mem. Torr. Bot. Club, iii. pt. 3, 53 (1893).

La Paz: Prov. Yungas: *Bang*, no. 252 (Gr., N. Y., Mo., Philad., Field Mus.). Prov. Caupolican: Tumupasa, alt. 550 m., *R. S. Williams*, no. 441 (N. Y.); hills, near Apolo, alt. 1677 m., *R. S. Williams*, no. 133 (N. Y.).
[Braz.]

18. **M. rubella** Lingelsheim. Twining shrub, 3–4 m. high, glabrous up to the puberulent inflorescence, darkening in drying; stem terete, purplish; internodes 5–17 cm. long; leaves broadly ovate-oblong, acuminate at each end, 7–10 cm. long, 4.5–6 cm. wide, entire, submembranaceous, pinnately veined, glabrous on both sides, slightly paler beneath; chief veins on upper surface running in slightly sunken channels, somewhat prominent beneath; petioles 1 cm. or more in length, their bases connected by a slight transverse ridge; branches of the inflorescence divaricate, 5–8 cm. long, naked nearly to the small dense corymbs (1.5–4.5 cm. in diameter) at their tips; bractlets linear-lanceolate, 2–3 mm. long; involucral scales oblong, dark-brown, rounded at tip, 5 mm. long, 1.2 mm. wide, ciliolate, slightly thickened at base, dorsally ochraceous-puberulent or -tomentellous; corollas 5–6 mm. long, glabrous, slender; proper tube 2 mm. long, gradually expanded into the subcylindric throat (3 mm. long); teeth deltoid, acute, 0.5 mm. long; achenes (still very immature) 2 mm. long; pappus-bristles about 57, salmon-red.—Lingelsheim in Fedde, Rep. vii. 250 (1909); Buchtien, Contrib. Fl. Boliv. i. 190 (1910).

La Paz: Prov. Larecaja: in woods of the tropical region at San Carlos near Mapiri, alt. 750 m., *Buchtien*, no. 1552 (N. Y., phot. and fragm. Gr.).

19. **M. guaco** H. & B. Stout twiner with large broadly ovate acuminate often scabrid leaves rounded at base then narrowed to cuneately winged petioles; heads chiefly sessile by 3's in rounded corymbs.—Pl. Aeq. ii. 84, t. 105 (1809). *M. amara*, var. *Guaco* (H. & B.) Bak. in Mart. Fl. Bras. vi. pt. 2, 237, t. 66 (1876); Britton, Bull. Torr. Bot. Club, xix. 2 (1892). *Willoughbya guaco* (H. & B.) Ktze. Rev. Gen. i. 372 (1891). *W. parviflora*, β. *guaco* (H. & B.) Ktze. l. c., iii. 184 (1898). For fuller descrip. see p. 46 of present paper.

Santa Cruz: Prov. Sara: Yapacani, *Kuntze* (N. Y.).
Dept. not clear: Junction of the Rivers Beni and Madre de Dios, *Rusby*, no. 1650 (Gr., N. Y., U. S., Mo., Philad., Field Mus.).
[Braz., Peru (acc. to Bak.), Colombia, Cent. Am.]

20. **M. speciosa** DC. Somewhat shrubby twiner; leaves shaped as in the preceding but densely gray-tomentose and reticulate-veiny beneath; heads similarly sessile by 3's in dense rounded corymbs.—Prod. v. 196 (1836). *Willoughbya Hieronymi* Rusby, Bull. N. Y. Bot. Gard. iv. 383 (1907). For further char. see p. 88 of the present paper.

La Paz: Prov. Nor Yungas: in wet clay soil, a "climber, on the ground, flowers bluish-green," *Bang*, no. 2169 (Gr., N. Y., U. S., Mo., Philad., Field Mus.).
[Peru.]

21. **M. cordifolia** (L. f.) Willd. Slender herbaceous or soft-woody twiner; stems and particularly branches hexagonal, the angles rib-like; leaves ovate, acuminate, cordate, slender-petioled.—Sp. Pl. iii. 1746 (1804); Britton, Bull. Torr. Bot. Club, xix. 1 (1892) in part. *Cacalia cordifolia* L. f. Suppl. 351 (1781). *Willoughbya cordifolia* (L. f.) Ktze. Rev. Gen. i. 372 (1891). *M. scandens* Britton, Bull. Torr. Bot. Club, xix. 1 (1892), in part (as to no. 1644), not Willd.

La Paz: Prov. Larecaja: Guanai, alt. 610 m., *Rusby*, nos. 1644 (Gr., N. Y., U. S., K., Field Mus., 1649 (Gr., N. Y., U. S., Field Mus.); between Mapiri and Tipuani, *Bang*, no. 1497 (Gr., N. Y., U. S., Mo., Field Mus.).
[Widely distrib. in trop. and subtrop. Am.]

22. **M. microptera** DC. A weak rather slender twiner; stem and branches hexagonal, the angles with exceedingly narrow (at times obsolescent) subherbaceous ridge-like wings; leaves deltoid-ovate, cordate and tending to be hastate; heads about 7 mm. long, pedicellate; florets white.—Prod. v. 196 (1836). *M. scandens* Britton, Bull. Torr. Bot. Club, xix. 1 (1892), as to pl. no. 1645, not Willd. For more detailed char. see p. 92 of this paper.

La Paz: Prov. Yungas (alt. 1830 m. acc. to Britton, l. c.), *Rusby*, no. 1645 (Gr., N. Y., U. S., K., Field Mus.).
[Braz., Peru.]

23. **M. flaccida** Robinson (see p. 9). Slender, weak, flaccid as if somewhat hydrophytic, probably reclining or drooping, with slight tendency to climb; obscurely strigillose on the stem about the nodes, in the inflorescence, and on the lower surface of the leaves, otherwise glabrous; stems subterete, sulcate-costulate, about 3 mm. in diameter, herbaceous; internodes 8–12 cm. long; branches flagelliform, flexuous, much elongated, 1 mm. or less in diameter; leaves (cauline) lanceolate, caudate-acuminate, undulate to entire, rounded at base, 6–8 cm. long, 1.7–2.6 cm. wide, thin-membranaceous, slightly

translucent, green on both surfaces, 3(–7)-nerved from near the base; petiole slender, about 17 mm. long; rameal leaves lanceolate, much reduced, 1–2 cm. long, 2–7 mm. wide; inflorescences axillary, repeatedly trichotomous, leafy-bracted, 6–8 cm. in diameter; peduncles about 7 cm. long, compressed; bracts lanceolate, 1–1.5 cm. long; bractlets similar, often exceeding the heads; pedicels angulate, 1–2 mm. long; heads about 8.5 mm. in height; involucral scales oblong, acute, thin, green, striatulate, 8 mm. long, 1.7 mm. wide; corollas (immature) 4 mm. long, glabrous; proper tube 1.5 mm. long, throat scarcely 1 mm. long, teeth lance-oblong, 1.5 mm. long; achenes (immature) slender, smooth, about 4 mm. long, tapering at base; pappus-bristles about 32, slightly scabrid, sordid-carneous.

La Paz: Prov. Nor Yungas: Polo-Polo near Coroico, alt. 1100 m., Oct. and Nov. 1912, *Dr. O. Buchtien*, no. 3951 (N. Y., phot. Gr.).

A plant of rather striking habit, with elongated runner-like branches, and flaccid texture suggesting dripping ledges as possible habitat, about which unfortunately there are no field notes.

24. **M. longiflora** (Rusby) Robinson. Vigorous lignescent twiner, 3–4 m. high; stems terete, 6 mm. or more in diameter, tawny-tomentellous, striate after drying, somewhat fistulose or with spongy pith; leaves broadly ovate, acute, inconspicuously glandular-denticulate (teeth scarcely 0.2 mm. high, about 7 mm. apart), above dull green and puberulent, beneath much paler, grayish-green, tawny-tomentellous, 3(–7)-nerved from the deeply cordate base, 12–18 cm. long, 9–11 cm. wide; petioles subterete, 5–6 cm. long, tawny-tomentellous; peduncles 4–12 cm. long; corymbs convex, disposed in a large terminal leafy-bracted panicle; heads about about 14 mm. long, often nodding on short curved pedicels; bractlets herbaceous, lanceolate, acute, about 4 mm. long, ciliolate, borne at the summit of the pedicel; involucral scales lance-oblong, acute, substramineous, puberulent, callose at the base, 7–8 mm. long; corollas white, glabrous; proper tube slender, 4 mm. long; throat distinctly enlarged, subcylindric, 3 mm. high; teeth deltoid-lanceolate, acute, 2 mm. long, recurved; achenes glabrous, 4 mm. long (still very immature); pappus-bristles about 110, pale; carneous, finely capillary, not thickened upward.—Proc. Am. Acad. xlvii. 196 (1911). *Willoughbya longiflora* Rusby, Bull. N. Y. Bot. Gard. iv. 382 (1907).

La Paz: Prov. Nor Yungas: in wet forest mould, at Calapampa near Coroico, *Bang*, no. 2325 (Gr., N. Y., K., Mo., Philad., Field Mus.); in similar situations also at Coripata, *Bang*, no. 2297 (Gr., N. Y., Mo., Philad., Field Mus.).

25. **M. micrantha** HBK. Weak twiner, herbaceous or nearly so; stem subterete though finely several-ribbed; leaves membranaceous, ovate-deltoid to -oblong, acuminate, often undulate, sagittate or usually somewhat hastate, with a deep open basal sinus; heads small for the genus, in numerous chiefly lateral pedunculate compound open or compact and rounded corymbs.—Nov. Gen. et Spec. iv. 134 (1820); Sch.-Bip. Bull. Soc. Bot. Fr. xii. 82 (1865). *M. micrantha*, var. Sch.-Bip. Linnaea, xxxiv. 536 (1865 66). *M. scandens* Britton, Bull. Torr. Bot. Club, xix. 1 (1892), in part (as to no. 1647), not Willd. *M. cordifolia* Britton, l. c., in part (as to no. 1648), not Willd. *Willoughbya micrantha* (HBK.) Rusby, Mem. Torr. Bot. Club, iv. 211 (1895). *W. scandens* Rusby, Bull. N. Y. Bot. Gard. iv. 381 (1907), not *M. scandens* (L.) Willd. *W. cordifolia* Rusby, Mem. Torr. Club, iii. pt. 3, 53 (1893); Rusby, Bull N. Y. Bot. Gard. iv. 381 (1907), in part (as to no. 2880), not *M. cordifolia* (L. f.) Willd. *M. sinuata* Rusby, l. c. viii. 127 (1912).

La Paz: Prov. Yungas: *Bang*, no. 696 (Gr., N. Y., U. S., Mo., Field Mus.). Prov. Larecaja: in temperate region, Miliguaya near Sorata, alt. 2550 m., *Mandon*, no. 267 (Gr., N. Y.); Mapiri, alt. 1525 m., *Rusby*, no. 1647 (Gr., N. Y., U. S., K., Field Mus.). Prov. Caupolican: Apolo, alt. 1464 m., *R. S. Williams*, no. 172 (N. Y.). Prov. Onasumos: near La Paz, alt. 3050 m., *Rusby*, no. 1648 (Gr., N. Y., U. S., K., Field Mus.).

Santa Cruz: Prov. Sara: Buena Vista, alt. 500 m., *Steinbach*, no. 5068 (Arn. Arb.).

Tarija (?): Chiquiaca, alt. 1000 m., *Fiebrig*, no. 2685 (Gr.).

Dept. not clear: San Juan, alt. 975 m., *R. S. Williams*, no. 207 (N. Y.); without locality, *Bang*, no. 2880 (Gr., Mo., U. S., N. Y. where bearing a Rusby label and stated to come from Reis, Bolivia), *Bang*, no. 2882 (Gr., Mo., U. S.).

[Widely distrib. in trop and subtrop. Am.]

Forma. α. **typica** Robinson (see p. 42). Inflorescence open-corymbose, the ultimate branching often clearly cymose.—Lit., synon., and exsicc. as above.

Forma. β. **congesta** (DC.) Robinson (see p. 43). Inflorescence denser, the heads scarcely pedicelled, packed in rounded glomerule-like corymbs.—*M. congesta* DC. Prod. v. 197 (1836). *M. scandens* Britton, Bull. Torr. Bot. Club, xix. 1 (1892) in part (as to no. 1646). *Willoughbya scandens*, var. *congesta* (DC.) Ktze., Rev. Gen. iii. 184 (1898).

Santa Cruz: Prov. Sara: Yapacani, alt. 400 m., *Kuntze* (N. Y., U. S.).

Dept. not clear: Junction of the Rivers Beni and Madre de Dios, *Rusby*, no. 1646 (Gr., N. Y., U. S., K., Field Mus.).

[Widely distrib. in trop. and subtrop. Am.]

26. **M. Schultzii** Robinson (see p. 19). Twining to 3 m.,

scarcely lignescent; stem terete, sulcate-costulate (after drying), brown, at first more or less tawny-tomentose especially about the nodes, in maturity often subglabrate, becoming 5 mm. or more in diameter; internodes 3–17 cm. long; leaves ovate, acuminate, coarsely crenate-serrate (teeth sometimes 4–5 mm. high and 7–10 mm. wide at base), cordate, membranaceous, green and puberulent on both surfaces, 4–12 cm. long, 3–6 cm. wide, 3(–5)-nerved from the base; petiole 2–3 cm. long, slender, fulvous-tomentellous; corymbs convex, together forming an at length flattish-topped compound inflorescence, the central axis being somewhat racemiform and more conspicuously bracteate than the lateral; lowest bracts leaflike, the succeeding ones much reduced, lance-subulate; pedicels filiform, 3–10 mm. long; involucral scales oblong, rounded at tip, 5 mm. long, the outer pair dorsally rounded and sordid-tomentellous, the inner slightly carinate and pubescent along the midnerve; corollas about 4 mm. long; the proper tube slender, 2 mm. long, beset with sessile glands; throat campanulate, about 0.9 mm. high; teeth lanceolate, about 1.3 mm. long, acutish, granulated dorsally; achenes dark-brown, smooth, tapering downward, 1.8 mm. long; pappus-bristles about 40, slightly thickened upward, dull white, becoming carneous in age.—*M. boliviensis* Sch.-Bip. Bull. Soc. Bot. Fr. xii. 82 (1865), without char., & Linnaea, xxxiv. 535 (1865–66), also without char., not Lingelsheim. *Willoughbya scandens* a form "near var. *barbinervia*" Rusby, Mem. Torr. Bot. Club, vi. 58 (1896).

La Paz: Prov. Larecaja: in the upper (subalpine) part of the wooded region between Queliguaya and Chilieca, near Sorata, alt. 3200-3400 m., *Mandon*, no. 265 (TYPE, Gr., N. Y.). Prov. Nor Yungas: in thickets, Unduavi, alt. 3300 m., *Buchtien*, no. 198 (N. Y.).

Cochabamba: Prov. Chapare: Espirito Santo, *Bang*, no. 1267 (Gr., N. Y., U. S., Field Mus., Philad., Mo.).

Nearly related to, but pretty certainly distinct from, *M. micrantha* HBK., a fact long ago noticed by Schultz-Bipontinus.

Ser. V. Globosae (see p. 49).

Key to Species.

Teeth of the corolla lance-oblong, fully equalling the throat; leaves membranaceous ..... 27. *M. desmocephala.*

Teeth of the corolla very small, deltoid, much shorter than the throat; leaves of firmer texture, chartaceo-subcoriaceous ..... 28. *M. Williamsii.*

27. **M. desmocephala** Robinson (see p. 7). Probably a tall twiner; stem subterete but (after drying) sulcate-pluricostate, dark purple, minutely scurfy or granulated, lignescent, fistulose, becoming 5 mm. or more in diameter; internodes 5–21 cm. long; leaves ovate-oblong, caudate-acuminate, entire, narrowly revolute on the edge, rounded at base, 10–15 cm. long, half as wide, membranaceous, glabrous on both surfaces, paler beneath, pinnately 5-nerved from near the base; petioles 2–4.5 cm. long; terminal panicle very large, compound, pyramidal, with opposite spreading branches; these again branched a second, third, or even fourth time; heads about 8 mm. long, sessile in dense subglobose glomerules (2 cm. in diameter); bractlets ovate, obtuse, about 2 mm. long, grayish-puberulent; involucral scales oblong, rounded at tip greenish- or brownish-straminеous, pulverulent-puberulent dorsally, finely striate; corollas 4–5 mm. long; the proper tube slender and definite, 2 mm. long; throat narrowly campanulate, 1.2 mm. high; teeth lance-oblong, 1.2 mm. long, obscurely granulated dorsally toward the at length recurved tip; achenes dark-brown, about 3.3 mm. long, slightly granulated on the faces, the ribs of lighter color; pappus-bristles about 25, not thickened upward, nearly smooth, in age carneous-subfulvous. — *M. angularis* Britton, Bull. Torr. Bot. Club, xix. 1 (1892), not H. & B.

La Paz: "near Yungas" [i. e. within or near the boundaries of the province of this name], alt. 1220 m., *Rusby*, no. 1740 (N. Y., phot. and fragm. Gr.).

28. **M. Williamsii** Robinson (see p. 19). In habit and many details closely simulating the preceding species, but differing in the following points: leaves of firm almost leathery texture; panicle (grayish-tomentellous) more divaricately branched, the glomerules somewhat larger (about 2.5 cm. in diameter); corollas with the proper tube (about 1.8 mm. long) gradually passing into a subfusiform throat (2.2 mm. long), the teeth of the limb being relatively short, scarcely over 0.5 mm. in length; achenes about 2.7 mm. long; pappus-bristles about 35, perceptibly thickened toward the tip.

La Paz: Prov. Caupolican: Charopampa, alt. 188 m., *R. S. Williams*, no. 696 (N. Y., phot. and fragm. Gr.).

Excluded, transferred, and doubtful Species.

M. amara, var *Guaco* (H. & B.) Bak. in Mart. Fl. Bras. vi. pt. 2. 237 (1876) = M. GUACO H. & B.

M. angularis Britton, Bull. Torr. Bot. Club, xix. 1 (1892), not H. & B. = M. DESMOCEPHALA Robinson (see above).

M. BANISTERIAE DC. This species of the Upper Amazon has been reported in Bolivia by Buchtien, Contrib. Fl. Boliv. i. 190 (1910), but error is suspected.

M. boliviensis Lingelsheim in Fedde, Rep. vii. 251 (1909); Buchtien, Contrib. Fl. Boliv. i. 190 (1901), not Sch.-Bip. = M. PUNCTATA Klatt (see p. 102).

M. boliviensis Sch.-Bip. Bull. Soc. Bot. Fr. xii. 82 (1865), & Linnaea, xxxiv. 535 (1865–66), not Lingelsheim = M. SCHULTZII Robinson (see p. 112).

M. cinnamomifolia Lingelsheim in Fedde, Rep. vii. 251 (1909), known to the writer from character only, differs in no significant described feature from M. DIOSCOREOIDES (Rusby) Robinson, with which it may well prove identical (see p. 98).

M. congesta DC. Prod. v. 197 (1836) = M. MICRANTHA HBK., forma CONGESTA (DC.) Robinson (see p. 111).

M. cordifolia Britton, Bull. Torr. Bot. Club, xix. 1 (1892) = in part M. CORDIFOLIA (L.) Willd., in part M. MICRANTHA HBK. (see pages 109 and 111).

M. Cumingii Sch.-Bip. Bull. Soc. Bot. Fr. xii. 82 (1865), & Linnaea, xxxix. 535 (1865–66) = OPHRYOSPORUS CUMINGII (Sch.-Bip.) Benth. ex Bak. in Mart. Fl. Bras. vi. pt. 2, 188 (1876); Robinson, Proc. Am. Acad. xlii. 25 (1906).

M. HASTATA (L.) Willd. Sp. Pl. iii. 1742 (1804). This plant, hitherto known only from Cuba and Jamaica, has been reported by Buchtien, Contrib. Fl. Boliv. i. 190 (1910), as collected by himself at San Carlos, Bolivia. The material on which this record was based has not been seen by the writer. On phytogeographic grounds it is highly improbable that a plant of the Antilles should turn up in the Andes of Bolivia. It seems pretty certain therefore that this record rests on some mistake of identification or clerical error.

M. hirsutissima Buchtien, Contrib. Fl. Boliv. i. 190 (1910), is presumably the same as *Willoughbya hirsutissima* Rusby, not Ktze., and if so appears inseparable from M. FERRUGINEA Rusby (see p. 101).

M. Lindbergii Britton, Bull. Torr. Bot. Club, xix. 1 (1892) = M. EUCOSMA Robinson (see p. 100).

M. Mandonii var. Sch.-Bip. Bull. Soc. Bot. Fr. xii. 82 (1865), & *M. Mandonii* Sch.-Bip. Linnaea, xxxiv. 536 (1865–66) = OPHRYOSPORUS PIQUERIOIDES (DC.) Benth. ex Bak. in Mart. Fl. Bras. vi. pt. 2, 188 (1876); Robinson, Proc. Am. Acad. xlii. 23 (1906).

M. rufa Britton, Bull. Torr. Bot. Club, xix. 2 (1892), not Benth. = M. RUSBYI Robinson (see p. 102).

M. scandens Britton, Bull. Torr. Bot. Club, xix. 1 (1892), not (L.) Willd. = in part M. CORDIFOLIA (L. f.) Willd. (see p. 109), in part M. MICRANTHA HBK. (see p. 111), in part M. MICRANTHA, forma CONGESTA (DC.) Robinson (see p. 111), and in part M. MICROPTERA DC. (see p. 109).

M. sinuata Rusby, Bull. N. Y. Bot. Gard. viii. 127 (1912) = M. MICRANTHA HBK. (see p. 111).

Willoughbya Bangii Rusby, Mem. Torr. Bot. Club, iii. pt. 3, 53 (1893) = M. DECORA Poepp. (see p. 98).

W. cordifolia (L.) Ktze. Rev. Gen. i. 372 (1891); Rusby, Mem. Torr. Bot. Club, vi. 58 (1896) = M. CORDIFOLIA (L. f.) Willd. (see p. 109).

W. cordifolia Rusby, Bull. N. Y. Bot. Gard. vi. 381 (1907), in part (as to no. 2880) = M. MICRANTHA HBK. (see p. 111).

W. Hieronymi Rusby, Bull. N. Y. Bot. Gard. iv. 383 (1907) = M. SPECIOSA DC. (see p. 109).

W. hirsutissima Rusby, Mem. Torr. Bot. Club, vi. 581 (1896), & Bull. N. Y. Bot. Gard. iv. 381 (1907), not Ktze. = M. FERRUGINEA Rusby (see p. 101).

W. leucophylla Rusby, Bull. N. Y. Bot. Gard. iv. 382 (1907) = M. LEUCOPHYLLA (Rusby) Robinson (see p. 106).

W. longiacuminata Rusby, Bull. Torr. Bot. Club, vi. 59 (1896) = M. LONGIACUMINATA Rusby (see p. 104).

W. longiflora Rusby, Bull. N. Y. Bot. Gard. iv. 382 (1907) = M. LONGIFLORA (Rusby) Robinson (see p. 110).

W. micrantha (HBK.) Rusby, Mem. Torr. Bot. Club, iv. 211 (1895) = M. MICRANTHA HBK. (see p. 111).

W. odorata Rusby, Bull. N. Y. Bot. Gard. iv. 381 (1907), not (Lehm.) Ktze. = M. HAENKEANA DC. (see p. 103).

W. scandens Rusby, Bull. N. Y. Bot. Gard. iv. 381 (1907) = M. MICRANTHA HBK. (see p. 111).

W. scandens a form "near var. *barbinervia*" Rusby, Mem. Torr. Bot. Club, vi. 58 (1896) = M. SCHULTZII Robinson (see p. 112).

W. trifolia Rusby, Bull. N. Y. Bot. Gard. iv. 382 (1907) = M. TRIFOLIA Sch.-Bip. (see p. 107).

W. trinervis Rusby, Bull. N. Y. Bot. Gard. iv. 381 (1907), not *M. trinervis* H. & A., is immature and doubtfully referred to M. BACCHAROIDEA Rusby (see p. 100).

CHILE.

Mikania is a genus largely of tropical and subtropical mesophytes. It is by no means surprising therefore that the group is scarcely represented in Chile. Indeed, the genus does not appear in Gay's fairly extended and detailed Flora Chilena (1845–52) and it was not until 1894 that Philippi, Ann. Univ. Chil. lxxxvii. 330, definitely recorded a single species from the country. This was described as new, under the name of *M. araucana*. It is a delicate herbaceous twiner of § *Corymbosae*. It has small membranaceous deltoid-hastate leaves, congested corymbs, very small heads, and pubescent rather blunt or shortly pointed involucral scales. The species was originally found in what is now the Province of Cautin in Central Chile, but Reiche, Fl. Chil. iv. 267 (1901) includes with it a plant, from the Province of O'Higgins 500–600 km. further north, having somewhat more coarsely toothed leaves.

A similar, if not identical plant was early collected by Poeppig in the intermediate Province of Talca. This was distributed under the number II. 106 (59), and was given the manuscript name *M. humilis* Kunze. See Hieronymus in Engl. Bot. Jahrb. xxii. 792 (1897).

Hieronymus, l. c., reduced to *M. scandens*, var. *congesta* (DC.) Bak. both this undescribed *M. humilis* Kunze and a similar, though slightly smoother and more xerophytic plant of western Argentina, namely *M. mendocina* Phil. Sert. Mendoc. Alt. 20, Ann. Univ. Chil. xxxvi. 178 (1870). As pointed out elsewhere in the present paper, the real *M. scandens* L. is a distinct North American species, and *M. congesta* DC. appears to be merely a densely corymbed form of the tropical *M. micrantha* HBK. These plants of Chile and adjacent Argentina, however, together with *M. periplocifolia* Hook. & Arn. Comp. Bot. Mag. i. 243 (1836), constitute a little group— or perhaps but a single slightly variable species—of somewhat more xerophytic nature and probably as distinct from the more tropical *M. micrantha* HBK. as both are from the remote and purplish-flowered *M. scandens* L. of North America.

Unfortunately, these highly technical and closely related plants of extra-tropical South America are much too slightly represented in North American herbaria to permit their satisfactory revision at this time and place. It is to be noted, however, that they form a problem not very closely connected with the other Andean groups here treated.

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I. THE GROUP OF POLYPODIUM LANCEOLATUM IN NORTH AMERICA.

By C. A. Weatherby.

The group of *Polypodium lanceolatum*, as here defined, consists of species which possess in common the following characters:—rootstocks slender, branched and widely creeping: scales of the rootstock never aristate-pointed, composed, except for the hyaline margin when present, of comparatively short and broad thick-walled cells, at least some of the scales (except perhaps in *P. panamense*) bearing near the point of insertion one to several thick, dark-colored, blunt trichomes: fronds simple, rarely and exceptionally sinuate-lobed: lamina decurrent as two green lines on the stipe for its whole length, lepidote on both surfaces, the scales of the lower surface orbicular to ovate-lanceolate: venation of a phlebodioid type, consisting of a single series of narrow costal areoles; a second series of larger and broader areoles set obliquely to the costa and containing, when well developed, two or three simple or branched included veinlets which may be free but are more often variously united by cross veinlets to each other and to the sides and apex of the areole; and outside of these one or more additional series of small irregular areoles whose number and shape vary with the size and width of the frond: sori large, borne at the confluence of included veinlets of the large areoles in a single series, producing peltate scales among the sporangia, but without the numerous and conspicuous paraphyses which in *P. percussum*, for instance, almost conceal the sporangia: spores oblong-ellipsoid or ovoid, smooth, usually yellowish and shining.

The earliest described species of the group is, of course, *P. lanceolatum* L. This must be regarded as based entirely on pl. 6, fig. 2 of Petiver's Pterigraphia, the sole citation under it. There is a specimen labelled *P. lanceolatum* in the Linnaean herbarium, but since, according to Jackson's Index, it was not in Linnaeus's possession in 1753, it cannot be taken as a type. Linnaeus's brief description follows neither Petiver's still shorter diagnosis nor the more elaborate one of Plumier accompanying his plate 137 (of which Petiver's figure is rather obviously a re-drawing, but which is not cited by Linnaeus). There is, however, nothing in it which could not have been suggested by the plate—the phrases "frondibus glabris" and "radice nudo," for instance, applying well enough to the drawing in which the scales of the lamina are not indicated at all and those of the rootstock only at the growing ends where they are most

conspicuous. There seems no reason to disturb the traditional application of the name to the group here placed under it.

As here understood, *P. lancolatum* is a species of wide distribution in tropical regions of America, Africa and India. In its main distinguishing characters it is constant enough throughout its range, but in certain other characters, notably those of the scales of the rootstock, it varies very considerably. The most readily recognizable of these variants occur in Mexico and Central America, and though their characters are far from constant either in themselves or their correlation with others, their extreme phases are sufficiently marked and their distributional areas so distinct, as to make their segregation as geographic varieties seem worth while. Since Petiver states that most of his plants came from the West Indies, the form of that region is taken as the type of the species.

I am indebted for aid in the preparation of this paper to Mr. Willard N. Clute who has furnished needed information; to Mr. Carl Christensen, who very kindly procured for me a fragment of the type collection of *P. astrolepis* Liebmann; to Mr. William R. Maxon for the loan of the large suite of specimens in the National Herbarium and other cordially given assistance;[1] and to the authorities of the Missouri Botanical Garden and of the Osborn Botanical Laboratory of Yale University for the privilege of examining specimens in these institutions.

KEY TO THE SPECIES AND VARIETIES.

a. Scales of the rootstock usually blackish or dark in color, often with pale margins, rarely pale and concolorous, never clathrate nor with cell-walls laterally excurrent.

b. Scales of the rootstock nearly uniform, appressed, suborbicular, peltate, 1 mm. or less in diameter, blackish, their cells quadrate, the body of the scale usually concealed by the abundant trichomes, which give the effect of a tomentose rootstock; stipe flattened, often obsolete, always less than one-half as long as the lamina; lamina with thin, non-cartilaginous margin; orbicular scales of the lower surface deeply lacerate-stellate; sori usually oblong ..... 1. *P. astrolepis.*

b. Scales of the rootstock of two kinds, one comparatively large (1.5–4 mm. long), ovate to lance-attenuate from a peltate base, conspicuous, the other small, orbicular to elliptic, closely appressed to the rootstock and concealed by the larger scales; trichomes present, but, if abundant, never concealing all the larger scales which project among them; margin of the lamina more or

[1] In citing specimens, the abbreviations G for the Gray Herbarium and N for the U. S. National Herbarium are used.

less cartilaginous and thickened; stipe terete (except in *P. lanceolatum*, var. *complanatum*); sori round to broadly oval.

c. Scales of the lower surface of the lamina erose-serrulate to entire, not deeply lacerate nor fimbriate-ciliate, those of the orbicular type more numerous.

d. Scales of the rootstock erose- or pectinate-serrulate, their median cells with lumina evident under an 8 × hand lens, or, if without, densely and conspicuously trichome-bearing; scales of the lower surface of the lamina usually sparse, brownish when young, more or less erose-serrulate.

e. Scales of the rootstock from black with a pale margin to pale brown and concolorous, never or only very rarely conspicuously trichome-bearing, the cells of the central band comparatively large, elongate-quadrate with somewhat projecting cell-walls and lumina evident under a hand-lens; orbicular scales of the lower surface of the lamina rather conspicuously erose-serrulate.

f. Lamina opaque, the veins immersed or, if rarely prominent, concolorous; scales of the rootstock (except those of the bud) always with a dark central portion.

g. Stipe terete; larger scales of the rootstock 2–4 mm. long, rarely smaller, lanceolate to lance-attenuate.....2. *P. lanceolatum.*

g. Stipe flattened; larger scales of the rootstock 1.5–2 mm. long, lanceolate or ovate-lanceolate .....2a. var. *complanatum.*

f. Lamina more or less translucent, the veins prominent beneath, at least some of those nearest the costa dark and apparently thickened, forming an indistinctly outlined pattern; scales of the rootstock 1.5–2 mm. long, often entirely pale and concolorous except for a dark spot at the point of insertion, lax and thin.....2b. var. *crassinervatum.*

e. Scales of the rootstock 1.5–2 mm. long, black with pale margins, usually abundantly and conspicuously trichome-bearing, their median cells comparatively small, the lumina not visible under a hand-lens; orbicular scales of the lower surface of the lamina rather sparsely short-denticulate.....2c. var. *trichophorum.*

d. Scales of the rootstock entire or with a merely irregular or at most minutely denticulate margin, rather firm, their median cells small, thick-walled and without evident lumina, not conspicuously trichome-bearing; under surface of the lamina usually densely beset with entire or sometimes denticulate scales which are reddish when young.....3. *P. polylepis.*

c. Scales of the lower surface of the lamina numerous, short-fimbriate to fimbriate-ciliate, those of the ovate-lanceolate type predominating.

h. Stipe often as long as the small (3.8–4.5 cm. long) lamina; lower surface of the lamina densely covered with imbricated, strongly rufescent, short-fimbriate, rather firmly attached scales, which usually wholly conceal the leaf-surface; costa green beneath.....4. *P. erythrolepis.*

h. Stipe shorter than the large (15–21 cm. long) lamina; lower surface of the lamina clothed with very delicate and lightly attached, hyaline, pale, long fimbriate-ciliate scales, which are numerous but do not conceal the leaf-surface; costa black beneath. 5. *P. Conzattii.*

a. Scales of the rootstock grayish or reddish-brown or, if blackish, with cell-walls laterally excurrent, evenly and conspicuously clathrate under a hand-lens.

i. Roootstock 2–3 mm. in diameter, its scales 1.5–2 mm. long, reddish-brown, their exterior cells closed by an outer wall, forming a subentire margin; fronds difform, the fertile much narrower.....6. *P. fructuosum.*

i. Rootstock 1 mm. in diameter, its scales 0.8–1 mm. long, grayish or blackish, their exterior cells without an outer wall, the side walls projecting beyond the hyaline margin as acicular dark teeth; fronds not markedly difform, though the fertile are slightly narrower. 7. *P. panamense.*

1. Polypodium astrolepis Liebm. Vid. Selsk. Skr. 5, i. 185 (1849), also reprint p. 33. *Grammitis elongata* Sw. Syn. Fil. 22, 213 (1806), not *Polypodium elongatum* Ait. (1789), nor Schrad. (1818). *G. lanceolata* Schkuhr, Krypt. Gew. 9, t. 7 (1806), not *Polypodium lanceolatum* L. (1753). *Grammitis revoluta* Spreng. ex Willd. Sp. Pl. v. 139 (1810) acc. to Mettenius, not *Polypodium revolutum* C. Chr. (1906). *G. squamulosa* Splitg. Tijds. Nat. Gesch. vii. 398 (1840), not *Polypodium squamulosum* Kaulf. (1824). *Drynaria Pricurii* Fée, Gen. Fil. 271 (1850–52). *Polypodium elongatum* Mett. Abh. Senkenb. Naturf. Ges. ii. 88, t. 2, f. 8, 9 (1857), not Ait., nor Schrad. *Pleopeltis angustifolia* D. C. Eaton, Amer. Journ. Sci. ser. 2, xxvii. 198 (1859). *Gymnogramme elongata* Hook. Sp. Fil. v. 157 (1864). *Taenitis Swartzii* Jenman, Journ. Bot. 1879. 263. *Polypodium lanceolatum*, var. *elongatum* Krug, Engl. Jahrb. xxiv. 131 (1897). *Polypodium Pricurii* Christ, Prim. Fl. Costaric. iii. 17 (1901).—Lamina linear-lanceolate to narrowly elliptic or oblanceolate or rarely ovate-lanceolate, obtuse or acute, in continental specimens 8–15 cm. long in well developed plants, in West Indian specimens averaging larger (15–20 cm., extreme measurement 24 cm.); stipe 5-18 mm. long, sometimes obsolete; costa black in the lower half of the lamina.—Mexico from Vera Cruz southward. Central America, throughout the West Indies, Guiana, and Brazil. The following specimens may be cited as representative of the species:

Mexico: Vera Cruz: Orizaba, 18 May, 1866, *Bourgeau* (G); May, 1905,

Purpus 1156 (G, N). Oaxaca: Trapiche de la Concepcion, 1841, *Liebmann* (fragment of the type-specimen in Gray Herb.). Chiapas: *Ghiesbreght* 446 (G); Finca Mexiquito, July, 1913, *Purpus* 6759 (G, N).

Costa Rica: San José, July, 1892, *Tonduz* 7121 (Hb. Boissier Fl. Cost.) (G, N).

Cuba: Monte Verde, Feb. 2 and July 2, 1859, *Wright* 796 (G, N); Feb. 13, 1911, *Shafer* 8683 (G, N). Porto Rico: Cayey, Oct. 8, 1885, *Sintenis* 2261 (G, N); near Ponce, Dec. 17, 1902, *Heller* 8300 (N).

Trinidad: 1877 S, *Fendler* 58 (G, N). French Guiana: near Cayenne, June, 1837, *Leprieur* (N). Brazil: Cupeiro Mts. of Matto Grosso, Dec. 20, 1893, *Lindman* A 2629 (N).

2. Polypodium lanceolatum L. Sp. Pl. 1082 (1753). *P. macrocarpum* Bory ex Willd. Sp. Pl. v. 147 (1810). *P. marginale* Bory ex Willd. l. c. *Pleopeltis ensifolia* Carm. Trans. Linn. Soc. xii. 510 (1818). *Polypodium adspersum* Schrad. Götting. Gel. Anz. 915 (1818). *Pleopeltis linearis* Kaulf. Enum. Fil. 246 (1824). *Polypodium lepidotum* Willd. ex Schlecht. Adumbr. 17 (1825).—North American specimens examined:

Mexico: Vera Cruz: Jalapa, 11 Feb. 1910, *Orcutt* 2841 (Hb. Mo. Bot. Gard.); without definite locality, *Hartweg* 1494 (Hb. Yale Univ.).

Costa Rica: around the Lagune of Reventado, alt. 2300 m., Jan. 25, 1889, *Pittier* 841 (N); without locality, Nov., 1886, *J. J. Cooper* (G, N). Nicaragua: Omotepec, 1853-6, *Wright* (G). Panama: moist exposed summit of Cerro de Lino, above El Boquete, Chiriqui, alt. 1560 m., March 6, 1911, *Maxon* 5211 (N); vicinity of Camp Aguacatal, eastern slope of Chiriqui Volcano, alt. 2100-2300 m., March 10-13, 1911, *Maxon* 5283 (N).

Jamaica: Cinchona, alt. 5000 ft., April 18, 1903, *Maxon* 1202 (N); Sept. 2–10, 1906, *Underwood* 3117 (N); alt. 5000 ft., Feb. 7, 1900, *W. N. Clute* 67 (N); vicinity of Whitfield Hall, June 4, 1904, *G. N. Collins* 97 (N); lower slopes of Mt. Moses, alt. 2000–2500 ft., April 14, 1903, *Maxon* 1069, 1084 (N); Sir John Peak, Sept. 2-10, 1906, *Underwood* 3211 (N).

Santo Domingo: near Constanza, alt. 2200 m., Aug., 1910, *v. Türckheim* 3551 (G, N).

Stipe 1–10 cm. long, varying much both in absolute length and relatively to the length of the lamina, but always shorter than the latter; lamina 3.5–27 cm. long, averaging about 15 cm., 0.5-3 cm. wide. After the manner of most ferns, the fronds occasionally fork at the tip (*Lepicystis lanceolata*, var. *dichotoma* Hieron. ex Mildbraed, Deutsch. Zent. Afrik. Exped. ii. 33. 1910?), and are rarely sinuate-lobate (var. *sinuatum* Sim, Ferns S. Afr. ed. 1, 202. 1892; *Lepicystis lanceolata*, var. *pinnatiloba* Hieron. l. c.).—On trees, stumps and, less often, walls and banks, Costa Rica to Juan Fernandez, Uruguay and northern Argentina; Jamaica and Santo Domingo; Africa from Cameroon and Abyssinia southward; Ceylon and southern India. The synonyms cited above were all founded on African plants. They appear to me to be correctly referred to *P. lanceolatum*.

2a. Polypodium lanceolatum L., var. **complanatum**, var. nov., rhizomatis paleis majoribus 1.5–2 mm. longis, lanceolatis vel ovato-lanceolatis, acutis acuminatisve, medio nigrescentibus, margine pallidis, cellulis medianis rectangularibus, ancipitibus; laminis lanceolatis 6–18 cm. (plerumque 10–15 cm.) longis, 0.7–2 cm. latis, crassis, coriaceis, opacis; costa saepius fusca; paginae inferioris paleis orbiculatis conspicue eroso-fimbriato-serrulatis.

Costa Rica: forests of Juan Vinas, Jan. 25, 1890, *Pittier* in Pittier & Durand, Pl. Costaric. Exs. no. 1855 (type in U. S. Nat. Herb.); Ochonojo, alt. 1600 m., Nov., 1898, *Pittier* 13025 (N); San Jeronimo, alt. 1500 m., Aug., 1910, *Wercklé* 560 (herb Jimenez) (N); La Fortuna, between Cervantes and Pacayas, alt. 1430 m., July, 1906, *Biolley* 93 (N); without locality, *Wercklé* (N).

Panama: Los Siguas Camp, southern slope of Cerro de la Horquete, Chiriqui, alt. about 1700 m., March 17–19, 1911, *Maxon* 5428; Rafallo Trail above El Boquete, alt. 1600–1700 m., Feb., 1918, *Killip* 5421.

Epiphytic. A plant which in its flattened stipe suggests *P. astrolepis*, but in all other characters plainly belongs with *P. lanceolatum*.

2b. Polypodium lanceolatum L., var. **crassinervatum** (Fée), comb. nov. *Drynaria crassinervata* Fée, Mém. des Foug. viii. 97 (1857). *Polypodium crassinervatum* Kiaersk, Cat. Fil. Herb. Ht. Haun. 49 (1874).

Mexico: Vera Cruz: region of Orizaba, 23 Aug., 1866, *Bourgeau* 2284ter (G); Cordoba, 1908, *John Spence* 101, 102 (G); Jalapa, Nov. 19, 1907, *Bro. Arsène* 1754 (N); Feb. 11, 1910, *Orcutt* 2841 (N). Chiapas: near Pantepec, Jan. 16, 1907, *Collins & Doyle* 224 (N); Aug. 13, 1901, *Rose & Hay* 6087 (N).

Guatemala: near Esperanza, Alta Verapaz, Jan. 19, 1905, *Maxon & Hay* 3351 (N); Finca Mocca, Alta Verapaz, alt. 3600 ft., Dec. 15, 1919, *Harry Johnson* 147 (G, N).

Stipe usually short, terete, dark, 0.7–2.5(–4) cm. long; lamina mostly 12–15 cm. long, 1–2 cm. wide, its orbicular scales rather more conspicuously erose-serrulate than in var. *trichophorum*. Probably epiphytic.

I have seen no specimens of the collections cited by Fée under *Drynaria crassinervata*, but the characters which he adduces—the translucent frond and darkened nerves—leave no doubt as to the identity of his plant. The latter character I should have considered pathological did it not repeatedly occur in correlation with the pale, soft scales of the rootstock and the short stipe characteristic of this variety.

Fink 82, of which there are three sheets in the National Herbarium and one in the Gray Herbarium, and *Gonzales & Conzatti* 581, 15 Dec., 1897 (G), both from Cordoba, Vera Cruz, show material more or less transitional in scale-characters to var. *trichophorum*.

2c. Polypodium lanceolatum L., var. **trichophorum** var. nov.,

rhizomatis paleis majoribus 1.5–2.5 mm. longis, ovatis vel late lanceolatis, medio nigrescentibus, margine pallido saepius angusto, trichomatibus dense onustis; cellulis medianis ex comparatione parvis parietibus crassis luminibus inconspicuis angustis; stipitibus teretibus, 1–8 cm. longis, semper lamina brevioribus; laminis lanceolatis vel lineari-lanceolatis, 6.8–28 cm. longis (plerumque 15–25 cm.), 1.2–2.5 cm. latis, coriaceis, opacis; costa infra saepe nigrescente; paleis orbiculatis paginae inferioris saepius diametro minus quam 0.5 mm., sparse et breviter denticulatis.—*Drynaria mexicana* Fée Mém. des Foug. viii. 97 (1857).—On trees and rocky banks.

Mexico: "Salto de Agua" 1905, *Purpus* 1591 (G, N). Colima: Manzanillo, March 2–18, 1891, *Palmer* 1409 (N); Cuhilla, east side, Volcano of Colima, alt. 8500 ft., July 21, 1905, *P. Goldsmith* 42 (G). Michoacan: vicinity of Morelia, various dates in 1910 and 1911, alt. 1950–2200 m., *Bro. Arsène* 5260, 6935, 5145, 6920, 10674, 6083, 6777 (all N); Patzcuaro, Nov., 1890, *Pringle* 3358 (G, N; of two sheets of this collection in N one, no. 833113, is mixed with *P. polylepis*). Mexico: lava fields near Eslaba, alt. 8000 ft., Sept. 23, 1903, *Pringle* 11797 (type in Gray Herb.; N). Morelos: Sierra de Tepoxlan, Sept. 21, 1903, *Rose & Painter* 7251 (N). Puebla: Teziutlan, Sept. 6, 1910, *Orcutt* 3993 (N); Boca del Monte, alt. 2300 m., Nov. 16–19, 1907, *Bro. Arsène* 2179 (G). Vera Cruz: Region of Orizaba, Aug. 23, 1866, *Bourgeau* 2884 (G); Santa Maria Alpatlahua, alt. 7500 ft., Sept. 1841, *Liebmann* (G). Oaxaca: vicinity of Totontepec, alt. 5500–7000 ft., July 15–20, 1894, *E. W. Nelson* 770 (N). Chiapas: near Pantepec, Jan. 15, 1907, *Collins & Doyle* 200 (N).

Guatemala: San Rafael, Dept. Zacatepequez, alt. 6500 ft., Feb., 1892, *Donnell Smith* 2742 (G, N); Coban, Dept. Alta Verapaz, alt. 4300 ft., Aug., 1880, *v. Türckheim* ed. Donnell Smith 495, 495B (G, N). June, 1908, *v. Türckheim* II. 2384b (N); San Miguel Uspantan, Dept. Quiché, alt. 6000 ft., April, 1892, *Heyde & Lux* ed. Donnell Smith 3253 (N); Nebaj, Dept. Quiché, alt. 7000 ft., April, 1889, *Heyde & Lux* ed. Donnell Smith 4688 (G, N); near Taitic, alt. 4500 ft., Dec., 1879, *v. Türckheim* 478 (N); Volcan de Fuego, *O. Salvin* (G).

I have seen specimens of none of the collections cited by Fée as belonging to his *Drynaria mexicana*, but his description seems to place his proposed species here. The "tomentose rootstock" excludes it definitely from var. *crassinerratum*, with which it was placed by Fournier, as here understood; and the "midrib black for its whole length" and the "revolute margins" exclude it almost as definitely from *P. astrolepis* to which it was referred by Christensen. Since, however, there is, in the absence of authentic specimens a possibility of error in referring it here and since there is already a valid *Polypodium mexicanum* likewise based on a species of Fée (*Selliguea mexicana*), it seems best not to take up Fée's name.

3. Polypodium polylepis Roem. ex Kze. Linnaea, xiii. 131 (1839). *Drynaria vestita* Fée. Gen. Fil. 271 (1850–52). *Pleopeltis lepidota*

Fourn. Pl. Mex. i. 87 (1870), at least in part, not *Polypodium lepidotum* Willd.—On trees, banks and rocks.

Mexico: San Luis Potosi: Alvarez, alt. 8000 ft., Sept. 5–10, 1902, *Palmer* 472 (N); Santa Barbara, Nov., 1830, *Berlandier* (G); Monte San Miguelito, 1876, *Schaffner* 938 (G); from market San Luis Potosi, Aug., 1898, *Palmer* 629 (N; "lingua cierval"); without locality, 1878, *Parry & Palmer* 975 (G, N). Guanajuato: 1883 *A. Dugès* (G; "lingua de ciervo"). Hidalgo: between Pachuca and Real del Monte, Aug. 31, 1903, *Rose & Painter* 6659 (N); Sierra de Pachuca, Sept. 1, 1903, *Rose & Painter* 6718 (N); ibid. July 20 and 24, 1905, *Rose, Painter & Rose* 8851 (N). Jalisco: Colotlan, Aug. 29, 1897, *Rose* 3609 (N); Sierra Madre, west of Balaños, Sept. 16, 1897, *Rose* 3716 (N); Volcano of Colima, July 13, 1892, *M. E. Jones* 507 (N). Michoacan: near Tlaupujahua, July 12, 1901, *Rose & Hay* 5393 (N); vicinity of Morelia, various dates in 1910, alt. 1950–2800 m., *Bro. Arsène* 5675, 7007, 10673 (N). Mexico: Popocatapetl, 10,000–11,000 ft., Aug. 7 and 8, 1901, *Rose & Hay* 6052 (N); Nevada de Toluca, alt. 8500–10,000 ft., Oct. 15, 1903, *Rose & Painter* 7879 (N); Sante Fé, Aug. 22, 1903, *Rose & Painter* 6516 (N); Toluca, Sept. 4, 1903, *Rose & Painter* 6799 (N); Tultenango, Oct. 13, 1903, *Rose & Painter* 7855 (N); Ixtaccihuatl, 1905, *Purpus* 1590 (G, N); La Encarnacion, July 7, 1905, *Rose, Painter & Rose* 8442 (N); Contreras, Aug. 9, 1910, *Orcutt* 3483 (N); mountains between Toluca and Mexico City, alt. 7500 ft., June 28, 1910, *Rusby* 167 (N); Popocatapetl, Aug. 5–6, 1910, *Hitchcock* (N); Valle de Mexico, Oct., 1875, *Schaffner* 73, 74 (N); El Oro, Nov., 1910, *Bro. Arsène* 10675 (N). Morelos: El Parque, Aug. 31, 1910, *Orcutt* 3844 (N). Puebla: vicinity of Puebla, various dates in 1906 and 1907, *Bro. Arsène* 1839 (G. N), 2179, 10669, 2313, 313, 10670 (N); Hacienda Jalapasco, alt. 10,000 ft., Feb. 27, 1892, *J. G. Smith* 61 (N). Vera Cruz: Mt. Orizaba, July 25 and 26, 1901, *Rose & Hay* 5706 (N); Aug. 23, 1866, *Bourgeau* 2884 (N); alt. 11,500 ft., *Seaton* 200 (G, N); San Juan de Carumatepec, alt. 6500 ft., 1841, *Liebmann* (G); Chinantla, alt. 7000 ft., *Liebmann* (N). Oaxaca: Cañada de San Gabriel Etla, alt. 3000 m., Aug. 8, 1897, *Conzatti & Gonzales* 300 (G). Chiapas: *Ghiesbreght* 266 (G).

Guatemala: Volcan de Agua, alt. 2700–3000 m., March 22, 1905, *Maxon & Hay* 3673 (N); "zu Guatemala, von 2000–4000 m. häufig," June 17, 1882, *Lehmann* 1559 (N).

A common Mexican species, closely related to *P. lanceolatum*, but usually readily distinguishable from it both by the scale characters given in the key and by its habit. The fronds are usually smaller than in *P. lanceolatum*, only occasionally reaching an extreme length of 17 cm., in average plants 9–12 cm. long or only 5–6 cm. in small ones. They are linear-lanceolate to narrowly oblanceolate in outline, only occasionally becoming truly lanceolate or ovate and then mostly in sterile specimens. The stipes are 1–4.5 cm. long, usually markedly shorter than the lamina. The costa may be either black or green beneath.

Certain forms are, however, as Fournier long ago pointed out, difficult to place satisfactorily. *Collins & Doyle* 135 from San Cristobal, Chiapas (N) and *Kellerman* 5947 from Quetzaltenango, Guatemala (N) have the habit and the sparse and small lamina-scales of *P. lanceolatum*. var. *trichophorum*, but these scales are nearly entire

and those of the rather stout rootstock have the characteristics of *P. polylepis*. These plants seem to me an extreme form of the latter.

4. **Polypodium erythrolepis**, sp. nov., rhizomate gracili, diametro 1.5–2 mm., longe repente, squamis aliis parvis orbiculatis vel ellipticis peltatis aliis majoribus 2–3 mm. longis ovato-lanceolatis longe acuminatis medio nigrescentibus cellulis quadrato-oblongis parietibus crassis margine pallide brunneis eroso- vel pectinato-serrulatis onusto. quarum generum ambo nonnullae tamen juxta insertionis punctum trichomata fusca pluria emittunt; stipite gracili, terete, squamoso, griseo, 2–4 cm. longo, laminam saepe aequante vel etiam superante; lamina coriacea, ovata, lanceolata, oblanceolatave, in apicem obtusum vel obtusiusculum angustata, basi sensim attenuata lineis duobus viridibus in stipitem usque ad phyllopodium decurrente, 1.5–4.5 cm. longa, 0.5–1.2 cm. lata, integra vel leviter sinuata, supra squamis sparsis 1.5–2 mm. longis juventute rubidis aetate albescentibus e basi peltato caudatis breviter fimbriato-ciliatis obsita, infra paleis plerumque ovato-lanceolatis attenuatis 1–1.5 mm. longis tenuibus juventute erubescentibus aetate griseis vel albescentibus breviter fimbriato-ciliatis imbricatis arcte adhaerentibus dense obtecta; nervatione pleopeltidis nervis immersis; costa supra prominente infra immersa, viride; margine paullum incrassato subcartilagineo; soris rotundis vel late ovalibus laminae partem superiorem vel paene longitudinem totam occupantibus, juventute squamulis peltatis deciduis inter sporangia instructis; sporangiis pyriformibus longe et tenuissime pedicellatis; sporis (ex specimine sonorense) ovoideis vel suboblongis, laevibus, flavescentibus.

Mexico: Chihuahua: cold cliffs, Pertrero Peak, Sept. 10, 1886, *Pringle* 825 (type in Gray Herb.; another sheet of the same number there and four in the Nat. Herb.). Sonora: Pine Ridge Pass, alt. 8000 ft., Dec 17, 1890, *Hartman*, Lumholtz Exp. 346 (G, N); without definite locality, Dec. 15, 1890, *F. E. Lloyd*, Lumholtz Exp. 480 (G, N).

A small, apparently terrestrial and mat-forming species of northwestern Mexico, similar in habit and color of scales to *P. polylepis* but well distinguished by its usually relatively long stipes and imbricated fimbriate-ciliate scales.

5. **Polypodium Conzattii**, sp. nov., rhizomate repente, diametro 2–3 mm., palearum trichomatibus sicut tomentoso, paleis aliis parvis orbiculatis vel ellipticis peltatis aliis majoribus 1.5–2 mm. longis e basi peltato ovato-lanceolatis medio nigrescentibus cellulis quadratis parietibus crassis margine angustissimo pallido serrulato onusto, quarum genera ambo juxta insertionis punctum trichomata fusca plurima paleas minores totius occultantia et tomentum densum for-

mantia emittunt; stipite ex speciminibus visis lamina valde brevioribus, 2.5–4.5 cm. longis terete, fusco, squamulis paucis obsito vel fere glabro; lamina coriacea, lineari-lanceolata vel lanceolata, 15–21 cm. longa, 1.4–2 cm. lata, in apicem acutum angustata e basi acuto duabus lineis viridibus in stipitem usque ad phyllopodium decurrente, nervatione pleopeltidis, nervis immersis utrinque paleis delicatulis hyalinis solum insertionis puncto vel rarius medio fuscatis dense obsitis, eis paginae superioris albidis aliis orbiculatis diametro 0.25 mm. stellato-fimbriatis aliis e basi angusto peltato lineari-caudatis sparse pectinato-ciliatis, eis paginae inferioris pallide brunneis paucis orbiculatis, pluribus e basi subdilatato peltato lanceolatis 1.5–2 mm. longis longe eleganterque fimbriato-ciliatis leviter a parenchymate disjungendis; costa utrinque prominente supra viride infra nigrescente; margine leviter incrassato, cartilagineo, integro vel subsinuato; soris magnis rotundis vel late ovatis, paleis deciduis lanceolatis fimbriatis inter sporangia instructis, laminae partem superiorem occupantibus; sporangiis pyriformibus, longe et tenuissime pedicellatis; sporis ellipsoideis, laevibus, flavescentibus.

Mexico: Cerro San Felipe, Oaxaca, alt. 3000 m., April 7 and 8, 1898, *C. Conzatti* 678 (G).

Known to me only from the type collection. A plant with the habit and stature of *P. lanceolatum*, but very distinct in its delicate, beautifully ciliate lamina-scales, which suggest those of certain species of *Elaphoglossum*.

6. **Polypodium fructuosum** Maxon & Weatherby, sp. nov., rhizomate longe repente, diametro circa 1.5 mm., frondes plurimas emittente, paleis laxis patulis 1.5–2 mm. longis e basi peltato deltoideo ovato-lanceolatis acutis margine subintegro clathratis cellulis quadratis oblongisve rarius solum trichomata brevia gerentibus onusto; frondibus difformibus; fertilibus valde angustioribus, laminis linearibus, 8.5–11 cm. longis, 5–6 mm. latis, in stipitem teretem sparsissime squamulosum sensim angustatis, apice acutis; sterilibus laminis ovato-lanceolatis, 9–10.5 cm. longis, 1.5–2 cm. latis, apice acutis, sessilibus vel in stipitem brevem (0.5–1.5 cm. longum) subalatum abrupte angustatis, nervatione pleopeltidis nervis immersis vel subprominentibus, utrinque paleis parvis 0.25–0.75 mm. longis orbiculatis vel ovatis centro fusco-brunneis margine serrulato hyalino angusto et infra paleis aliis 1–1.5 mm. longis oblongo-ovatis clathratis secundum costam obsitis; costa utrinque prominente, concolore; margine non incrassato integro vel minute crenato-serrulato; soris magnis, late ovalibus, 5 mm. longis, laminae totam longitudinem et

latitudinem occupantibus paleis eorum non visis; sporangiis pyriformibus longe et tenuissime pedicellatis; sporis ellipsoideis, laevibus, flavescentibus.

PANAMA: on branch fallen from large tree, humid forest along the upper Caldera River near "Camp I," Holcomb's trail above El Boquete, Chiriqui, alt. 1450–1650 m., March 22–24, 1911, *Maxon* 5689 (TYPE in Nat. Herb.); fallen tree in deep woods, valley of Rio Piarnasta above El Boquete, alt. 1525–1530 m., Feb. 9, 1918, *Killip* 5418 (N).

In habit and appearance similar to *P. lycopodioides*, but in its venation, scale-characters and lepidote fronds nearest *P. lanceolatum*. From both it differs in its clathrate scales, which however, are not very far removed in shape and general type from those of *P. lanceolatum*, var. *crassinervatum* and form a connecting link between them and the extreme clathrate type found in *P. panamense*. The scales of these two species are unique among American species of the *Pleopeltis* group, but are similar to those of the glabrous-fronded Old World species, *P. linearе* and *P. Scolopendrium* (*P. excavatum* Bedd. et auctt., not Bory).

7. **Polypodium panamense** sp. nov., rhizomate longe repente, gracili diametro 0.75–1 mm., paleis laxis fuscis vel nigrescentibus 0.8–1 mm. longis suborbiculatis-ovatis acutis cellulis magnis quadratis vel oblongis parietibus crassis clathratis marginibus irregulariter laceratis cellularum parietibus extremis excurrentibus onusto; trichomatibus observatis nullis; frondibus subdistantibus, fertilibus saepe plus minusve angustioribus; stipitibus fuscis leviter complanatis plus minusve clathrato-squamulosis 1.5–4 cm. longis laminis valde brevioribus; laminis lanceolatis vel late ovatis apice et basi angustatis, 4–9.5 cm. longis, 1–3 cm. latis, coriaceis, supra paleis plerumque orbiculatis parvis eroso-serrulatis vel breviter fimbriatis peltatis non clathratis brunneis margine angustissimo pallido sparse, infra frequentius paleis aliis brunneis orbiculatis peltatis parvis 0.25 mm. diametro vix clathratis aliis ovato-lanceolatis 0.5–1 mm. longis discincte clathratis saepe fusciorибus obsitis; costa utrinque prominente, supra viride, infra fusca; margine tenui, non cartilagineo; nervatione pleopeltidis ei *P. lanceolati* simili, in frondibus latioribus areolis exterioribus pluri-seriatis; soris magnis ad 7 mm. longis rotundis vel late ovatis, paleis deciduis orbiculatis breviter fimbriatis peltatis brunneis 0.5 mm. diametro inter sporangia instructis; sporangiis pyriformibus, longe et tenuissime pedicellatis; sporis ovoideis, pallide flavescentibus.

PANAMA: on tree trunks, forests around Porto Bello, Province of Colon, alt. 5–200 m., April 6–8, 1911 *Maxon* 5784 (TYPE in U. S. Nat. Herb., sheet

no. 676331); also a second sheet of the same collection, no. 676332; Bismarck, March 17, 1908, *R. S. Williams* 503 (N).

Excluded Species.

Polypodium lanceolatum, var. *Elizabethae* Jenman, Bull. Bot. Dept. Jamaica, ix. 199 (1897). Known to me only from specimens collected by W. N. Clute (no. 847; N) which, Mr. Clute informs me. were taken at Jenman's type station near Cinchona, the only known locality for the plant in that vicinity or, probably, in Jamaica. These specimens are exactly *P. leucosporum* Kl. There would seem to be little doubt that Jenman overlooked the scale characters which, as well as the pinnately lobed frond, separate *P. leucosporum* from *P. lanceolatum* and that his name should be reduced to synonymy under the former species. *P. leucosporum* is known to occur in South America from Venezuela to Peru but has not, so far as I am aware, been hitherto reported from the West Indies.

II. NOTES ON CERTAIN LEGUMINOSAE OF THE TRIBE PSORALEAE.

By J. Francis Macbride.

In continuing from time to time the ordering up of portions of the *Leguminosae* at the Gray Herbarium, certain nomenclatorial changes have been made in order to have the work conform to the International Rules of Botanical Nomenclature. The resulting new names and new combinations of names are here placed on record.

Psoralea tenuiflora Pursh, var. **Bigelovii** (Rydb.), comb. nov. *Psoralidium Bigelovii* Rydb. N. Am. Fl. xxiv. 14 (1919).

This variety is closely related to the variable *P. tenuiflora* Pursh, the range of which, however, is on the whole, different. The leaves of var. *Bigelovii* apparently are uniformly obovate or broadly oblanceolate.

Dr. Rydberg's extreme segregation of *Psoralea* and its allies is almost revolutionary in character. One wonders if his treatment will be followed by any students of the flora of the Old World where the group is well represented. If so, they will propose a number of new genera to take care of species which do not exactly fall into any of Dr. Rydberg's genera since these have apparently been drawn up at least to some extent without study of closely allied groups that grow outside the range of the North American Flora.

Psoralea scaposa (Gray), comb. nov. *P. hypogaea* Nutt., var *scaposa* Gray, Bost. Journ. Nat. Hist. vi. 173 (1850). *Pediomelum scaposum* (Gray) Rydb. N. Am. Fl. xxiv. 21 (1919).

There is no evidence that the characters indicated by Rydberg l. c., as distinctive for this plant are not constant. These characters, moreover, are fairly well marked so that there seems to be no question but that the plant merits specific recognition.

Psoralea humilis (Rydb.), comb. nov. *Pediomelum humile* Rydb., N. Am. Fl. xxiv. 24 (1919).

An excellent species that may be readily distinguished by its acaulescent habit.

Psoralea macrostachya DC., var. **longiloba** (Rydb.), comb. nov. *Hoita longiloba* Rydb. N. Am. Fl. xxiv. 10 (1919). *Hoita villosa* Rydb. l. c.

It seems to me that *P. macrostachya* is a highly variable species from which certain forms, even though at times widely divergent, should not be specifically divided. I have seen only three of the several related plants to which Rydberg assigns specific rank. Two of these it seems advisable to merge under one varietal name as indicated above. The variety *longiloba*, so constituted, may be more or less readily distinguished by the somewhat elongate lower calyx-lobe and also frequently by the denser pubescence, especially on the stems.

Another plant which seems to be only a variety of *P. macrostachya* is *Hoita rhomboidea* Rydb. (*P. macrostachya* DC., var. *rhombifolia* Torr.). This is a more glabrous state with a tendency for the racemes to be somewhat shorter than they commonly are in the typical form.

Parosela Benthami (Brandg.), comb. nov. *Dalea Benthami* Brandg. Proc. Cal. Acad. ii. 2. 148 (1889); *Psorobatus Benthami* (Brandg.) Rydb. N. Am. Fl. xxiv. 40 (1919).

Parosela megacarpa (Wats.), comb. nov. *Dalea megacarpa* Wats. Proc. Am. Acad. xx. 359 (1885). *Psorobatus megacarpus* (Wats.) Rydb. N. Am. Fl. xxiv. 41 (1919).

The genus *Parosela*, as it has been defined by most if not all recent students, seems to be a rather natural group although like most large genera it contains some subgroups which possess a technical character or two not shared by the great majority of the species. Nevertheless the plants that make up these subgroups are, on the whole, good Paroselas and for my part I fail to see that the underlying principles of classification are in any way benefited by removing

them from *Parosela* as Rydberg has done. They may be distinguished sectionally but they cannot be separated generically without assigning them an importance which they do not merit. For fundamentally they are Paroselas; they certainly are not of the related genera *Eysenhardtia* or *Amorpha* and to treat them as though they were as well defined groups as these and the genus *Parosela* will appear to most students inexpedient.

Parosela Fremontii (Torr.) Vail, var. **Wheeleri** (Vail) Robinson, in herb. *P. Wheeleri* Vail, Bull. Torr. Club, xxiv. 17 (1897). *Psorodendron Wheeleri* (Vail) Rydb. N. Am. Fl. xxiv. 42 (1919).

Although Rydberg, l. c. 41, distinguishes *P. Wheeleri* from *P. Fremontii* by the "obovate or oval" instead of "oblong to lanceolate or linear" leaflets he describes, l. c. 43, the leaves of the latter species as "oblong, elliptic or rarely obovate." *P. Wheeleri* is evidently but a broad-leaved variety of *P. Fremontii.*

P. Saundersii (Parish) Abrams is scarcely more than a nearly glabrous state of *P. Fremontii* and accordingly may become

Parosela Fremontii (Torr.) Vail, var. **Saundersii** (Parish), comb. nov. *Dalea Saundersii* Parish, Bull. S. Calif. Acad. ii. 83 (1903). *P. Saundersii* (Parish) Abrams, Bull. N. Y. Bot. Gard. vi. 396 (1910). *P. Johnsoni* (Wats.) Vail, var. *Saundersii* Parish, Bot. Gaz. lv. 308 (1913).

Parosela tinctoria (Brandg.), comb. nov. *Dalea tinctoria* Brandg. Proc. Cal. Acad. 2, ii. 147 (1889). *Psorothamnus tinctorius* (Brandg.) Rydb. N. Am. Fl. xxiv. 47 (1919).

This species although closely related to *P. Emoryi* (Gray) Heller seems to differ constantly not only in the shorter calyx-lobes, as indicated by Rydberg, l. c. 46, but also in the more divergent branching of the plant. *P. Emoryi* is intricately branched.

Parosela mollis (Benth.) Heller, var. **neo-mexicana** (Gray), comb. nov. *Dalea mollis* Benth. var. ? *neo-mexicana* Gray, Pl. Wright, i. 47 (1852). *P. neomexicana* (Gray) Heller, Cat. N. Am. Pl. ed. 2. 6 (1900).

The acute banner and acutish wings of the corolla are the only characters I find that show any degree of constancy; in the typical form the parts of the corolla are rounded or sometimes retuse at apex.

P. longipila [Robins.] Rydb. N. Am. Fl. xxiv. 64 (1919) differs from *P. mollis* not only in the acute banner of the corolla but also in the elliptical leaves, rounded at apex, and accordingly seems worthy of specific recognition. I am unable, however, to distinguish even varietally *P. pilosa* Rydb. and *P. mollissima* Rydb., l. c., ad-

ditional segregates of *P. mollis*. The characters relied upon by Rydberg appear entirely relative. In this connection it seems interesting to note that cotype material of both species in the Gray Herbarium is referred by Rydberg without question to *P. mollis*.

Parosela laxiflora (Schlecht.), comb. nov. *Dalea laxiflora* Schlecht. Linnaea, xii. 293 (1838). *D. Hegewischiana* Steud. Nom. Bot. ed. 2. i. 480 (1840). *P. Hegewischiana* (Steud.) Rydb. N. Am. Fl. xxiv. 57 (1919).

Rydberg does not take up Schlechtendal's name because of the presence of *Dalea laxiflora* Pursh, Fl. Am. Sept. 741 (1814). The latter, however, is a synonym of *P. emacandra* (Nutt.) Britton and since the cognomen *laxiflora* has not before been used in *Parosela*, it is to be retained as indicated above.

Parosela leporina (Ait.) Rydb., var. **alba** (Michx.), comb. nov. *Dalea alba* Michx. in Roem. Cat. Hort. Turic. (1802). *D. alopecuroides* Willd. Sp. Pl. iii. 1336 (1803). *Parosela alopecuroides* (Willd.) Rydb. Fl. Ry. Mts. 483, 1063 (1917).

Except for the lighter-colored flowers and bracts there is no essential difference between the plant of the Mississippi valley and *P. leporina* of Mexico. The bracts of the latter are often nearly glabrous but in this there is variation. Futhermore, the plant with pale flowers ranges south into Mexico and the darker-flowered form north to New Mexico. *Dalea alba*, therefore, seems to be only a geographical variety of the earlier-named *P. leporina*. *P. costaricana* Rydb. N. Am. Fl. xxiv. 77 (1920), is, I think, not to be distinguished from *P. leporina* even varietally. In its white flowers it approaches the variety *alba*.

There is another variant, however, that deserves recognition on account of its extremely dark and somewhat pubescent bracts, dark flowers and uniformly low stature. This form may be known as

Parosela leporina (Ait.) Rydb., var. **Thouini** (Schrank), comb. nov. *Dalea Thouini* Schrank, Pl. Rar. Hort. Monac. i. 9 (1819). *P. Thouini* (Schrank) Rydb. N. Am. Fl. xxiv. 78 (1920).

Parosela vernicia Rose, var. **citrina** (Rydb.), comb. nov. *P. citrina* Rydb. N. Am. Fl. xxiv. 81 (1920).

This plant may be treated only as a variety of *P. vernicia* since, except for the lesser elongation of the bract-tips there is no single distinguishing character that displays constancy.

Parosela ramosissima (Benth.) Heller, Cat. N. Am. Pl. ed. 2. 6 (1900). *P. Brandegei* Rose, Contrib. U. S. Nat. Herb. x. 106 (1906).

In as much as *Dalea ramosissima* Mart. & Gal. Bull. Acad. Brux.

x. pt. 2, 41 (1843) is a synonym of *P. diffusa* (Moric.) Rose, this specific name may be retained for the plant described by Bentham in 1844, Bot. Voy. Sulph. 11. Rydberg, N. Am. Fl. xxiv. 71 (1920), contrasts *P. ramosissima* with *P. lasiostachya*, and allies. It appears rather to be related to *P. Hemsleyana* (cf. Rose, l. c. 104) notwithstanding the fact that the corolla is rose-colored throughout.

Parosela tomentosa (Cav.) Rose, var. **psoraleoides** (Moric.), comb. nov. *Dalea psoraleoides* Moric. Mém. Soc. Genève, vi. 533 (1833). *P. psoraleoides* (Moric.) Rose, Contrib. U. S. Nat. Herb. x. 104 (1906).

Apparently the only essential difference between *P. tomentosa* and *P. psoraleoides* is the lighter and somewhat yellowish tint to the corolla of the latter; the corolla of the former, which possibly is a trifle larger, is pink. Accordingly it seems advisable to treat the more recently described form as a variety, especially since the ranges nearly coincide.

Parosela polycephala (Benth.) Rydb., var. **minutifolia** (Rydb.), comb. nov. *P. minutifolia* Rydb. N. Am. Fl. xxiv. 87 (1920).

The variety is distinguishable from the typical form chiefly by the glabrous instead of minutely pubescent leaflets, although Rydberg, in his arrangement of the species of *Parosela*, places the two forms three pages apart.

Parosela triphylla (Sessé & Moc.), comb. nov. *Dalea triphylla* Sessé & Moc. ex G. Don, Gen. Hist. ii. 224 (1832). *D. trifoliolata* Moric. Mém. Soc. Genève, vi. 531 (1833). *P. trifoliolata* (Moric.) Rydb. Fl. N. Am. xxiv. 98 (1920).

It seems strange to me that Rydberg, l. c., did not take up the above name for this well-marked species. The description of *D. triphylla*, it is true, is meager, but the short characterization is definite and apparently could apply to no other species then known. Rydberg, l. c., also refers doubtfully to *D. trifoliolata*, *D. prostrata* Ortega, Dec. 69 (1798). If Ortega's rather full description is even reasonably accurate he surely had before him a quite different plant, as indicated by Moricand, l. c. 533.

Parosela versicolor (Zucc.) Rydb., var. **tsugoides** (Rydb.), comb. nov. *P. tsugoides* Rydb. N. Am. Fl. xxiv. 102 (1920).

Since *P. tsugoides* is scarcely distinguished from true *P. versicolor* except by the narrower, more pubescent and strongly involute leaflets, it seems to me preferable to treat it as varietally rather than specifically distinct, for the differences are of a type often dependent upon the habitat of the plant.

PAROSELA WISLIZENI (Gray) Vail, var. **sanctae-crucis** (Rydb.), comb. nov. *P. Sanctae-Crucis* Rydb. N. Am. Fl. xxiv. 103 (1920). *Dalea Wislizeni* var., Gray, Pl. Wright. ii. 38 (1853).

As indicated by Gray, l. c., this variety differs from the typical form in the lesser and shorter pubescence, the leaves being glabrous or nearly so above. I have not seen authentic material of *P. leucantha* Rydb., l. c., but it appears to be only a form with lighter flowers.

P. Wislizeni is very closely related to *P. versicolor*. Indeed, it might be considered a geographical variety of the latter. But as there is a wide gap between the ranges of the two species—*P. versicolor* is restricted to southern Mexico while *P. Wislizeni* and its variants belong to the northern portion and the southwestern United States—in which apparently no intermediate forms occur, *P. Wislizeni* may best be kept distinct. It is generally a shorter, less widely branched shrub with flowers varying from bright rose-color to white. Apparently the flowers of *P. versicolor*, as stated by Rydberg, l. c. 70, are uniformly dark purple, or the banner alone may be white.

PAROSELA LASIOSTACHYA (Benth.) Rose, var. **glabrescens** (Rydb.), comb. nov. *P. glabrescens* Rydb. N. Am. Fl. xxiv. 106 (1920).

The only noteworthy difference between this plant and the typical state of the species is the pubescence of the immature leaves. The pod is the same, i. e., densely villous with only a few minute glandular dots toward the summit, which character distinguishes the species from the related *P. Wislizeni* and *P. versicolor*. The pods of these two species are much less pubescent and are conspicuously dotted with large glands.

Another variant of *P. lasiostachya* is glabrous like the type, even as to the immature leaves, but these are more involute and the corolla is of a lighter color. This form may be known as

PAROSELA LASIOSTACHYA (Benth.) Rose, var. **involuta** (Rydb.), comb. nov. *P. involuta* Rydb. N Am. Fl. xxiv. 107 (1920).

The group of species typified by *P. microphylla* is divided by Rydberg, N. Am. Fl. xxiv. 67 (1920) as follows:

"Calyx not conspicuously glandular-dotted between the ribs; leaves glabrous; spikes short . . . . . xxxvii. MICROPHYLLAE.
Calyx with a row of conspicuous yellow or brown glands between the ribs; leaves more or less pubescent . . xxxviii. LEUCOSTOMAE."

The contrast here seems definite; but let us turn to page 71, l. c. and read, *under the Microphyllae*, "glands of the calyx very conspicuous. 155. *P. fuscescens*." And *under the Leucostomae*, "Leaves glabrous." Furthermore, *P. microphylla* is distinguished at once

from the other glabrous-leaved species by the red or yellow glands, yet under the *Leucostomae* (cf. the key quoted above) are placed *P. argyrostachya* and *P. Botterii*, with black glands.

As Dr. Rydberg's key has not been found workable and as there is a species, apparently undescribed, to be added to the group, the following classification may be given. The species are closely related but the presence or absence of pubescence seems to be a good character which, furthermore, is usually concomitant with less obvious but equally constant characteristics.

a. Leaflets glabrous.
  b. Glands of the inflorescence red or yellow; foliage drying green.
    c. Leaflets 11–19, mostly less than 6 mm. long.....1. *P. microphylla.*
    c. Leaflets 13–35, more than 6 mm. long.....2. *P. diversicolor.*
  b. Glands black; foliage drying black.
    d. Calyx pubescent throughout.....3. *P. melantha.*
    d. Calyx-tube glabrous, at least the lower half.
      e. Corolla drying yellow; stems glabrous nearly or quite to the spikes.....4. *P. argyrostachya.*
      e. Corolla drying rose-purple; stems pubescent above...5. *P. Botterii.*
a. Leaflets pubescent.
  f. Corolla yellow.
    g. Calyx-tube pubescent or glabrous, in the latter case the bracts caudate-acuminate; shrubs often over 1 m. high.
      h. Calyx-tube densely pubescent, at least about the top.....6. *P. lutea.*
      h. Calyx-tube glabrous or essentially so; bracts long-acuminate.
        i. Calyx nearly or quite glandless; leaflets mostly 31.....7. *P. Arsenei.*
        i. Calyx conspicuously glandular; leaflets fewer.
          j. Leaflets 11–17, more or less villous on both sides.....8. *P. gigantea.*
          j. Leaflets 17–25, sparsely pubescent, at least beneath, the hairs short.....9. *P. macrostachya.*
    g. Calyx-tube glabrous or with a few scattered hairs toward the top; bracts acute or short-acuminate; low shrubs less than 6 dm. high.
      k. Calyx-teeth plumose-pilose; leaflets pubescent on both sides.....10. *P. plumosa.*
      k. Calyx-teeth merely pilose; the hairs strongly ascending; leaflets glabrous above.....11. *P. Painteri.*
  f. Corolla dark blue.....12. *P. atrocyanea.*

P. fuscescens Rydb. N. Am. Fl. xxiv. 109 (1920) I think is not to be distinguished from *P. melantha* (S. Schauer) Rydb. I have not seen Palmer's no. 209 on which the species is based, but Purpus's no. 1376 from Hidalgo is referred by Rydberg in the Gray Herbarium to *P. fuscescens*.

Another species omitted is *P. Wardii* Rydb., l. c., 112, separated

from *P. lutea* Cav. on account of the somewhat smaller corollas and "glabrous bracts." The bracts, rather, are glabrate; this may prove to be a variety of *P. lutea*. Better marked is *P. caudata* Rydb., l. c., because of the caudate-acuminate bracts which equal or surpass the calyx. However as this appears to be the only character of any consequence, and somewhat variable, the plant may be known as

Parosela lutea Cav., var. **caudata** (Rydb.), comb. nov. *P. caudata* Rydb. N. Am. Fl. xxiv. 112 (1920), not *P. caudata* Rydb., l. c., 82.

Parosela zimapanica (S. Schauer) Rydb. is the proper name for the plant referred to above as *P. microphylla* if the latter is confined to South America, as Rydberg thinks, l. c. 109. I have not seen *P. diversicolor* Rydb. to which, by a typographical error in the key in the North American Flora, l. c. 71, are ascribed leaflets "usually more than 5 cm." long. The more numerous leaflets, "7–9 mm. long," seem to distinguish the species from *P. microphylla*.

Parosela Arsenei, spec. nov., fruticosa ut videtur 1 m. alta; ramulis foliisque parce pilosis; foliis numerosis, 5–7 cm. longis, 27–33 (plerumque 31)-foliolatis; foliolis 0.5 mm. petiolatis oblongo-ovalibus circa 7 mm. longis, fere 4 mm. latis, apice rotundatis vel paululo emarginatis; spicis oblongo-cylindricis densis plerumque 7 cm. longis; bracteis ovato-lanceolatis, plus minusve abrupte caudato-acuminatis, circa 5 mm. longis, calyce paulo brevioribus dorso fere glabcis vel ad apicem mediocriter villosis; calycibus obscure vel haud glandulosis, tubo glabro circa 3 mm. longo; laciniis subulatis villosis circa 2 mm. longis; corolla circa 12 mm. longa, flava.—Mexico: vicinity of Morelia, Michoacan, *Arsène* 5596 (type, Gray Herb.).

The relationship and the salient characters of this species are brought out in the foregoing key. The specimen is one of a collection made in Mexico in 1910 by *Bro. G. Arsène*, whose name this plant may appropriately bear.

Dr. Rydberg has emphatically called attention to the closeness of the genera *Parosela* and *Petalostemum* by removing from the former the group of species typified by *P. albiflora*, for which group he has proposed the name *Thornbera* Rydb. Journ. N. Y. Bot. Gard. xx. 66 (1919). The segregate genus is characterized as having the clawless or short-clawed wings and keel-petals inserted at the mouth of the staminal tube, as in *Petalostemum*. There are 9 or 10 stamens, however, as in *Parosela*. In proposing *Thornbera* the author indicates that these aberrant species must either be placed in a separate genus, or transferred to *Petalostemum*, or *Parosela* and *Petalostemum*

must be united. A fourth possibility, and to me obviously the most natural treatment of these plants, — i. e., their retention in *Parosela* —does not seem to have occurred to Rydberg.

Probably there are few large genera that do not, in the case of some species, merge. The disposition of the species that are thus on the border line, as it were, between two genera may sometimes be satisfactorily determined by discovering the character or characters that most constantly distinguish the plants from one of the genera. If we apply this method to the species referred by Rydberg to *Thornbera* we find that the stamens are always 10 or 9 as in true *Parosela*, although a few species retained in *Parosela* by Rydberg may sometimes have only 7 stamens, thus in this respect approaching the always 5-stamened *Petalostemum*. There are also species of *Parosela* that have the habit and the petals of *Petalostemum*. Now if we observe the insertion of the petals in species of *Parosela* we find that they are not inserted at a given point on the stamineal tube, but that the place of insertion is different for different species. It is apparent therefore that this character, i. e., the petal-insertion, is variable within the genus *Parosela* and consequently does not constitute a proper basis for generic segregation. As *Thornbera* rests only upon this character, the genus cannot logically be retained. *Parosela*, as noted above, also contains species that in other characters approach or match those known to belong constantly to *Petalostemum*. Is it not evident, therefore, that the latter genus is properly distinguished from the former by the constant presence of 5 stamens and that the homogeneity of *Parosela* is not disturbed by the presence of 9- and 10-stamened species that have the petals inserted as in *Petalostemum*? It would be decidedly inconsistent, however, to refer *Thornbera* to *Petalostemum*,—a disposition suggested by Rydberg—for in the latter genus there is no variation in the position of the petals on the stamineal tube and the number of stamens is constant. Accordingly it is obvious that *Thornbera* is most closely related to true *Parosela* and as its "key" character is not fundamental, being of a variable nature, it may become

PAROSELA Cav., subgenus **Thornbera** (Rydb.), comb. nov. *Thornbera* Rydb. Journ. N. Y. Bot. Gard. xx. 66 (1919).

PAROSELA DALEA (L.) Britton, var. **robusta** (Rydb.), comb. nov. *Thornbera robusta* Rydb. N. Am. Fl. xxiv. 121 (1920). *Dalea virgata* Micheli, Bull. Herb. Boiss. ii. 442 (1894), not *D. virgata* Lag. Gen. & Sp. Nov. 23 (1816).

The name "robusta" is well chosen for this variety since it differs

from the typical form of the species in the more robust habit and larger—1 cm. or more thick—spikes.

Parosela pumila (Rydb.), comb. nov. *Thornbera pumila* Rydb. N. Am. Fl. xxiv. 120 (1920).

If the low stature of this plant and the broadly obovate bracts were the only features, as noted by Rydberg, to distinguish it from *P. Dalea*, it would scarcely merit specific recognition but the calyx-lobes are uniformly shorter, being somewhat less than 2 mm. long and not quite equaling the calyx-tube. The longer calyx-lobes of *P. Dalea* usually surpass (or at least equal) the calyx-tube in length. It is worthy of note, also, that *P. pumila* is known only from Sinaloa and that several collections from there exhibit no variation in the characters mentioned. *P. Dalea* has not been secured north of Tepic.

Parosela tenuicaulis (Hook. f.), comb. nov. *Dalea tenuicaulis* Hook. f. Trans. Linn. Soc. xx. 226 (1851).

Parosela pazensis (Rusby), comb. nov. *Dalea pazensis* Rusby, Mem. Torr. Bot. Club, iii. pt. 3. 18 (1893).

Parosela parvifolia (Hook. f.), comb. nov. *Dalea parrifolia* Hook. f. Trans. Linn. Soc. xx. 225 (1851).

Parosela multifoliolata (Clos), comb. nov. *Psoralea multifoliolata* Clos in Gay, Fl. Chile, ii. 87 (1846); *Dalea multifoliata* (Clos) Phil. f. Cat. Pl. Vasc. Chile, 55 (1881).

Parosela humifusa (Benth.), comb. nov. *Dalea humifusa* Benth. Pl. Hartw. 170 (1845).

Parosela cylindrica (Hook.), comb. nov. *Dalea cylindrica* Hook. Bot. Misc. ii. 213 (1831).

Parosela coerulea (L. f.), comb. nov. *Galega coerulea* L. f. Suppl. 335 (1781). *Dalea coerulea* (L. f.) Schinz & Thellung Mém. Soc. Neuchât. Sci. Nat. v. 370 (1913). *D. Mutisii* Kunth, Mim. 161 (1824).

In listing *D. Onobrychis* DC. Prod. ii. 247 (1825) in Journ. Bot. xxii. 36 (1885) Mr. John Ball remarks: "Scarcely distinct as a species from *D. Mutisii* Kunth." Our material seems to confirm this observation.

Parosela calliantha (Ulbrich), comb. nov. *Dalea calliantha* Ulbrich in Fedde, Rep. ii. 11 (1906).

Parosela boliviana (Britton), comb. nov. *Dalea boliviana* Britton, Bull. Torr. Club, xvi. 259 (1889).

III. DYSCRITOTHAMNUS, A NEW GENUS OF COMPOSITAE.

By B. L. Robinson.

(With plate.)

In finishing the study of a considerable number of tropical American *Compositae*, lent some years ago by the Director of the Berlin Botanical Garden for study and determination at the Gray Herbarium, a very puzzling specimen has been encountered. It is a plant represented solely by rather small, poorly dried, much broken and somewhat insect-damaged portions of a low and presumably xerophytic shrub.

The label indicates that it was collected by Carl August Ehrenberg, January 1840, on steep mountain slopes between Las Ajuntas and Las Ranas,[1] somewhere in Mexico. No such place-names have been found in atlases or on maps readily available; but fortunately Ehrenberg in a brief account of his collecting of *Cacti* mentions Las Ajuntas in a way that indicates closely its position,[2] and this must have been near the boundary between Queretaro and Hidalgo in Central Mexico.

On the sheet the only attempt to indicate the identity of the plant consists of an unsigned note in pencil reading: "Carminatia n. sp. vel nov. gen." However, the plant has a chaffy receptacle, subcorymbous inflorescence, short and unangled but villous-hirsute achenes, and alternate subfiliform leaves. It can thus have no close relationship to the erect annual monotype *Carminatia*, very dissimilar both in habit and technical characters.

The label shows that this was Ehrenberg's no. 1075 but although Hemsley in the Biologia Centrali-Americana cites many of Ehrenberg's specimens—whether specifically determined or not—he does not seem to have mentioned this particular number. Probably it was not represented at Kew or in the other herbaria examined in the preparation of the work. Indeed, it has been thus far impossible to learn of its presence in any herbarium other than that of Berlin. Nor after considerable search has any reference to this number been found in literature.

[1] "Bei Las Ajuntas am Wege nach las Ranas."

[2] See Linnaea, xix. 343 (1847), where Ehrenberg says "Bei Las Ajuntas, wo sich der Moctezumafluss mit dem Flusse von Toliman vereinigt * * * " This, of course, establishes the position of Las Ajuntas; and from the manner in which it is mentioned on the label Las Ranas must have been a small settlement in the immediate neighborhood.

It is likely that the plant in nature is a rare or very local one. Queretaro, Hidalgo, and the adjacent states of Mexico have been visited repeatedly by botanists, indeed by such effective collectors as Thomas Coulter, Hartweg, Schaffner, Pringle, Palmer, Rose, Purpus, and Arsène. Most of their plants are very fully represented in the larger North American herbaria, but thus far neither the plant in question nor any very close relative has been found among them. Possibly Ehrenberg's no. 1075 was a "unicate" and these small bits, now belonging to the herbarium of the Botanical Museum at Berlin-Dahlem, are all that were collected of this particular plant. Ehrenberg appears to have been primarily in search of cacti and such plants as would be suited to cultivation. It is not improbable that his collecting of other species was rather incidental and that few duplicates were taken unless there was some promise of horticultural interest.

When in Berlin in 1905 the writer found the Ehrenberg sheet among unnamed *Eupatoriae* and was most kindly permitted to borrow it for detailed examination. He has returned again and again to its study, but always without being able to place it in any known species or genus, or indeed to refer it with certainty to any tribe of the *Compositae*. Furthermore, the fragmentary nature of the material seemed at first hardly to justify its use as a generic type. However, as on several former occasions when dealing with inadequate material, the writer sought the aid of Mr. F. Schuyler Mathews, who with his usual skill has recorded effectively each of the characters as cautious dissection brought them to view. Supplemented by his detailed and very accurate plate it is believed that the following technical description will record the genus so fully that there can be no difficulty in recognizing the plant whenever it may be rediscovered.

Dyscritothamnus, gen. nov. Capitula mediocria pauciflora pedicellata homogama discoidea. Receptaculum valde convexum paleis angustis persistentibus onustum. Corolla graciliter tubulosa elongata; tubo proprio faucibus cylindricis gradatim ampliatis multo breviore; limbo subbilabiato; labia exteriore 4-dentata; labia interiore integra vix dentibus labiae exterioris longiore; dentibus omnibus quinque ovato-oblongis acutiusculis. Antherae connatae angustissimae ad apicem cum appendice ovato-oblonga obtusa basi subintegrae nec cordatae nec sagittatae nec caudatae. Styli rami filiformes valde recurvati, obtusiusculi extus minute papillati. Achaenia obovoidea densissime sursum villosa nec angulata nec costata. Pappi setae multae inaequales praesertim basin versus plumosae, longioribus corollam subaequantibus.—Frutex xerophyticus

nanus; caule identidem dichotomo; ramis arcuatis; foliis alternis filiformi-linearibus caducis.

D. filifolius spec. nov., fruticosus glaber ca. 3 dm. altus; caule tereti ca. 3 mm. crasso iterum et iterum furcato primo folioso deinde cum cicatricibus foliorum delapsorum scabrato; ramis patentibus curvato-adscendentibus; foliis subfiliformibus acutis supra enerviis subtus paullo carinatis post exsiccationem nigricantibus 2–3 cm. longis 0.5–0.8 mm. latis sessilibus integerrimis patentibus saepe curvatis; capitulis ad apices ramulorum subcorymbosis paucis ca. 10-floris pedicellatis ca. 12–13 mm. longis et 6 mm. crassis; involucri squamis lanceolatis acuminatis tenuibus subscariosis glabris 2–3-seriatim imbricatis et paullo gradatis; paleis disci linearibus attenuatis flosculos subaequantibus persistentibus; corollis graciliter tubulatis glabris; tubo proprio ca. 2.5 mm. longo; faucibus gradatim ampliatis subcylindricis 6 mm. longis; dentibus limbi ca. 1.4 mm. longitudine; achaeniis villoso-hirsutis ca. 2.5 mm. longis et 1.8 mm. crassis; pappi setis numerosis capillaribus modice plumosis albidis.—Mexico: on mountain walls in the range near Las Ajuntas on the way to Las Ranas [near the boundary between the states of Queretaro and Hidalgo], *Ehrenberg*, January, 1840, no. 1075 (type, Brl., phot. and slight fragm. Gr.).

As already intimated the plant does not fall convincingly into any of the tribes of the *Compositae-Tubuliflorae*. It is true its slightly zygomorphous corollas suggest possible affinity with the *Mutisieae;* but in that tribe the anthers are almost always caudate, while here they are entire-based. In the few genera of the *Mutisieae* which have ecaudate anthers, such as *Schlechtendalia* and *Barnadesia* the style-branches are short, somewhat flattened and suberect, instead of being as here filiform.

In the Berlin Herbarium the Ehrenberg sheet had been provisionally referred to the *Eupatorieae*. But that tribe has almost throughout columnar distinctly 5-angled or 8–10-ribbed achenes, more elongated and usually less recurved style-branches, and nerveless anther-appendages. Furthermore, a chaffy disk and alternate leaves are not very frequent in the tribe and irregularity of corolla quite foreign to it.

If ultimately it receives a place in the *Eupatorieae* it will be relegated there not so much on account of any obvious affinity as because of the difficulty of finding any more natural disposition.

Of course, its general involucral and floral traits keep it clearly out of certain tribes like the *Anthemideae*, *Calenduleae*, *Arctotideae*,

and *Cynareae*. Its entire-based anthers distinguish it from the *Vernonieae*, its capillary pappus from the *Helianthеae*, and chaffy disk from the *Heleniеae*. There remain only the *Astereae* which have flattened and more definitely appendaged style-branches the *Inuleae*, which normally have caudate anthers, and the *Senecioneae*, generally characterized by penicillate style-branches. In all three of these tribes irregularity of the corolla, while not unprecedented, is unusual and a chaffy receptacle is exceptional. It is true that there are a few genera in the *Senecioneae* in which the style-branches are filiform and fail to show the penicillate character usual in the tribe, but none of these shows any approach to the present plant, either in general habit or in the combination of technical characters.

In case the genus is ultimately referred to the *Eupatoriеae* it should probably follow *Carphephorus* with which it corresponds in having a chaffy disk, plumose pappus, and alternate leaves. If placed among the *Inuleae* it would find some habitally similar neighbors in such genera as *Pegolettia* and *Jasonia;* and in fact *Pegolettia* has a plumose pappus and a strikingly similar irregularity in the corolla in which one tooth is a trifle more deeply cut away from the rest than they are from each other. However, these habitally similar genera of the *Inuleae* are not only geographically remote but possess in accentuated degree the characteristic long-tailed anthers of the tribe.

If placed in the *Astereae* it would fall, in consequence of its homogamous heads of perfect florets, among the *Solidagineae* somewhere near *Bigelowia*, but without any very obvious affinity, differing as it does in its filiform style-branches, chaffy disk, and irregular corollas.

In consideration of these facts it may be well for the present to append this little-known monotype to the *Eupatoriеae*. Happily the genus *Carphephorus* with which it shares some important technical characters is ordinarily placed at the end of the tribe. Thus if the new genus is inserted immediately after *Carphephorus* it will fall between the *Eupatoriеae* with which it has some traits in common and the *Astereae* where its relatively short plump and hairy achenes would form no anomaly.

Unfortunately the color of the florets was not recorded by the collector. They have faded to a dingy brownish shade. Had they been bright yellow in nature, some trace of this color would have probably been retained after drying. It is probable therefore that they were white, roseate, purplish, or possibly ochroleucous.

The generic name, from δύσκριτος, *hard to determine*, and θάμνος, *shrub*, seems to be justifiable.

Should anyone find further material of this plant, either in field or herbarium, the writer would welcome information of the fact.

Explanation of Plate.

Figs. 1–10: *Dyscritothamnus filifolius*. Fig. 1, habit, natural size. Fig. 2, leaf × 4. Fig. 3, head × 4. Fig. 4, receptacle, conical in form, the bases of the persistent pales shown × 6. Fig. 5, corolla × 6. Fig. 6, limb of the opened corolla, showing irregularity × 12. Fig. 7, bases and tips of anthers × 12. Fig. 8, upper portion of style × 12. Fig. 9, achene × 6. Fig. 10, pappus-bristle × 12.

IV. A REVISION OF ASTRAGALUS, SUBGENUS HOMALOBUS, IN THE ROCKY MOUNTAINS.

By J. Francis Macbride.

The desire to place in the Gray Herbarium under the name *Astragalus*, an excellent specimen received from Mr. I.W. Clokey of Denver, referred by him to *Homalobus decurrens* Rydb., resulted in the following revision. This includes the species known to Dr. Rydberg to grow in the area covered by his Flora of the Rocky Mountains and Adjacent Plains—broadly speaking, the central Rocky Mountain states—and I acknowledge with appreciation my indebtedness to his treatment, with which, however, I cannot agree, either in the generic delimitation of the group or in the specific lines.

For instance he "keys," l. c. 455, *Homalobus* Nutt. under the characterization "Pods 1-celled, the partition if any rudimentary." This describes the pods of all species included by him in *Homalobus*, but in *Atelophragma* Rydb., "keyed" under the same heading and distinguished by Rydberg, l. c., from the former genus by "Partial partition present," is placed *A. Arthuri* Jones, described by Rydberg himself, l. c. 507, as having pods with "Partial partition broad, making the pod almost 2-celled!" This single discrepancy is cited as one of many that seem to show the futility, recognized by Gray, Proc. Am. Acad. vi. 188–190 (1864). Nelson, Coulter & Nelson, New Man. Ry. Mt. Bot. 280 (1909) and Bot. Gaz. liii. 222 (1912), Wooton & Standley, Contrib. Nat. Herb. xix. 357 (1915), Jones, Proc. Cal. Acad. Sci. Ser. 2. v. 633 (1895), and others of segregating

the on the whole homogeneous group *Astragalus* L., notwithstanding the fact that a few species suggest the genus *Trifolium*—an interesting phenomonon but to my mind not an argument at all for the further disassociation generically of either group.

In considering the specific limitations of the plants referred by Rydberg to *Homalobus* I have reached the conclusion that nearly all the members of this subgenus are extremely plastic, responding quickly to various ecological conditions. Therefore, I have been constrained to recognize only as varieties (or to reduce entirely) many of the forms assigned by Rydberg to specific rank. However, some of the species apparently not capable of sharp definition nevertheless merit recognition, notably *A. hylophilus* which in some forms approaches very closely *A. serotinus*, var. *Pallisері* and yet for the most part is reasonably well-marked. In spite of the existence of perplexing forms, therefore, I think the species should be retained.

I have omitted *A. grallator* Wats. Zoe, iii. 52 (1892), which Rydberg has allied to *A. wingatanus* Wats. Jones, Proc. Cal. Acad. Sci. Ser. 2. v. 646 (1895), however, considers it an aberrant state of *A. Haydenianus* Gray. To this disposition I am not inclined to agree, but on the other hand, the species is surely more out of place in the neighborhood of *A. wingatanus*, etc., for the pods certainly are not "decidedly flattened laterally."

Excluding *A. grallator* I think that twenty-six species, instead of forty-five as recognized by Rydberg, may be distinguished as follows:

Key to Species and Varieties.

a. Pods evidently flattened laterally.

b. Leaves simple, or rarely some of them 3-foliolate; densely cespitose plants.

c. Pods ovate-oblong, 5–10 mm. long, the sutures rather prominent; peduncles often scarcely exceeding the leaves.....1 *A. simplicifolius.*

c. Pods oblong-linear, 8–15 mm. long, the sutures thinner; peduncles often elongate.....1a. var. *caespitosus.*

b. Leaves pinnate; if the leaflets reduced to phyllodia, the plants not densely cespitose.

d. Pods sessile, or if stipitate, the stipe never much exceeding the calyx.

e. Pods distinctly broader than oblong-linear or obviously stipitate.

f. Leaflets linear-filiform or not developed.

g. Calyx-teeth minute; flowers less than 10 mm. long; pods membranous.....3. *A. lancearius*

g Calyx-teeth 1.5 mm long; flowers about 12 mm. long; pods subcoriaceous.....4 *A. episcopus.*

f. Leaflets broader, always well-developed.

h. Pods ridged on the sides, acuminate, black-hairy.....5. *A. Bourgovii.*
h. Pods not ridged, merely acute, rarely black-hairy.
i. Plants 1–2 dm. high, rather densely cespitose; racemes short; pods only about 8 mm. long.
j. Peduncles 2–3 cm. long, mostly shorter than the leaves; pods white-hairy.....6. *A. pauciflorus.*
j. Peduncles mostly longer and exceeding the leaves; pods black-hairy.....7. *A. debilis.*
i. Plants not densely cespitose, usually taller; racemes more or less elongate; pods rarely less than 1 cm. long.
k. Pods sessile or very nearly so.
l. Oblong-elliptic, about 4 mm. wide, strictly sessile.....8. *A. wingatanus.*
l. Oblong, about 3 mm. wide, very shortly stipitate.
m. Flowers and leaflets remote, mostly 1 cm. or more apart; stems flexuose, widely branched.....9. *A. Dodgeanus.*
m. Flowers and leaflets crowded, usually only a few mm. apart; stems strict or bushy-branched.
10a. *A. tenellus*, var. *Clementis.*
k. Pods stipitate, the stipe at least as long as the calyx-tube.....10. *A. tenellus.*
e. Pods of a linear or oblong-linear type, or somewhat oblanceolate, sessile and usually more than 1.5 cm. long.
n. Rush-like plants seemingly leafless (the leaves reduced to phyllodia), or the terminal leaflet greatly prolonged, as a continuation of the rhachis.
o. Stems 2–6 dm. high; pods 2.5–3 cm. long.
p. Calyx 4–5 mm. long, the teeth usually little if at all longer than broad; leaves often all reduced to phyllodia.....11. *A. campestris.*
p. Calyx 5–6 mm. long, the teeth usually longer than broad; lower leaves, at least, more or less strongly developed..11a. var. *diversifolius.*
o. Stems 1–2 dm. high; pods 12–15 mm. long. 12. *A. Garrettii.*
n. Leafy plants, the lateral leaflets of even the upper leaves well-developed.
q. Stems densely tufted, 1–1.5 dm. high; leaflets .5–1.5 cm. long; racemes dense, usually 2–4 cm. long.
r. Leaflets mostly 5, aristately tipped.....2. *A. detritalis.*
r. Leaflets 7–15, not aristately tipped.
s. Pods 1.5 cm. or less long; leaves grayish-strigose, at least beneath.
t. Pods linear-oblong, 2–3 mm. wide; leaves strigose on both surfaces....13. *A. divergens.*
t. Pods widened above the middle to about 3.5 mm.; leaves glabrous or nearly so above.....14. *A. Carltonii.*

s. Pods 1.5–2.5 cm. long; leaves greenish, the pubescence sparse.....15. *A. decumbens.*

q. Stems taller, not densely tufted or the racemes lax, 5–12 cm. long; leaflets 1–4 cm. long.

n. Leaflets lanceolate to elliptic-oval, acutish or obtuse; pods 2–2.5 cm. long.

v. Terminal leaflet little if any longer than the lateral leaflets and with evident articulation to the rhachis.

w. Pods glabrous.....16. *A. hylophilus.*

w. Pods pubescent .....16a. var. *oblongifolius*

v. Terminal leaflets distinctly longer than the lateral and tapering into the rhachis without evident articulation.....17. *A. Rydbergii.*

n. Leaflets oblong, or linear to lance-linear, or if broader the pods only 1.5 cm. long.

x. Pods about 2 cm. long; racemes often 1 dm. long.

y. Pods glabrous or nearly so; leaves usually glabrous above.....18. *A. serotinus.*

y. Pods pubescent; leaves strigose on both surfaces.....18a. var. *strigosus.*

x. Pods about 1.5 cm. long; racemes usually shorter.....18b. var. *Palliseri.*

d. Pods long-stipitate, the stipe distinctly exserted from the calyx.

z. Pods membranous, strongly flattened; calyx-tube 3–4 mm. long

aa. Flowers yellowish; pedicels about 3 mm. long.19. *A. stenophyllus.*

aa. Flowers red-purple; pedicels about 2 mm. long...20. *A. Coltoni.*

z. Pods membranous-coriaceous, not strongly flattened; calyx-tube 7–8 mm. long.

bb. Pods straight.....21. *A. collinus.*

bb. Pods curved.....22. *A. curvicarpus.*

a. Pods terete or nearly so.

cc. Pods sessile or the stipe shorter than the calyx.

dd. Pods 5 mm. or more in diameter; flowers 1 cm. or more long.

ee. Pods glabrous; flowers about 1.5 cm. long.....23. *A. Hallii.*

ee. Pods pubescent; flowers about 1 cm. long.....24. *A. Fendleri.*

dd. Pods 4 mm. or less in diameter; flowers usually about 7 mm. long.....25. *A. flexuosus.*

cc. Pods long-stipitate.....26. *A. lonchocarpus.*

1. A. SIMPLICIFOLIUS (Nutt.) Gray, Proc. Am. Acad. vi. 231 (1866). *Phaca simplicifolia* Nutt. ex T. & G. Fl. N. Am. i. 350 (1838). *Homalobus simplicifolius* (Nutt.) Rydb. Bull. Torr. Club, xl. 52 (1913). *A. lingulatus* Sheld. Minn. Bot. Stud. i. 118 (1894). *H. lingulatus* (Sheld.) Rydb. l. c. *A. exilifolius* A. Nels. Bull. Torr. Club, xxvi. 10 (1899). *H. exilifolius* (A. Nels.) Rydb. l. c. *H. uniflorus* Rydb. l. c. xxxiv. 49 (1907). —Wyoming and adjacent Idaho to northern Utah and Colorado.—WYOMING: Freezeout Hills, *E. Nelson*, 4493; Carter, June 25, 1896, *M. E. Jones;* Laramie Hills, *A. Nelson*, 31;

Alcova, *Goodding*, 142; Hanna, *E. B. & L. B. Payson*, 1694; Laramie, *A. Nelson*, 7289; northwestern Wyoming, *Parry*, 68 & 69. COLORADO: north of La Porte, *Crandall*, 758; Cañon City, June, 1877, *Brandegee*. UTAH: Brush Creek Cañon, *Goodding*, 1285; Wasatch Station, *Watson*, 289.

1a. A. SIMPLICIFOLIUS (Nutt.) Gray, var. CAESPITOSUS (Nutt.) Jones, Proc. Cal. Acad. Sci. Ser. 2. v. 647 (1895). *Homalobus caespitosus* Nutt. ex T. & G. Fl. N. Am. i. 352 (1838). *A. caespitosus* (Nutt.) Gray, Proc. Am. Acad. vi. 230 (1864). *H. brachycarpus* Nutt. l. c. *H. canescens* Nutt. l. c. *A. spatulatus* Sheld. Minn. Bot. Stud. i. 119 (1894). *A. simplicifolius* (Nutt.) Gray, var. *spatulatus* (Sheld.) Jones, Contrib. W. Bot. x. 65 (1902).—The Central Rocky Mountain States east to Saskatchewan and Nebraska.—SOUTH DAKOTA: Newell, *Carr*, 15; Black Hills, 1887, *Dr. W. H. Forwood;* Crook Mountain Ranger Station, *John Murdoch, Jr.*, 3561. ASSINIBOIA: Medicine Hat, *Macoun*, 4211; Cypress Hills, *Macoun*, 4210, and 28. NEBRASKA: Harrison, June 4, 1891, *Bates*. WYOMING: Newcastle, June 17, 1896, *Bates;* Yellowstone, 1878, *Havard;* Cheyenne, *Greene*, 27.

All of Nuttall's species named above are represented in the Gray Herbarium by material labeled in his own writing. It is a study of this material in conjunction with the specimens cited that has convinced me of the futility of Rydberg's attempt to recognize six species in this group, typified by *A. simplicifolius*. That there is but one variable species concerned seems evident from the fact that the characters relied upon by Rydberg to distinguish the forms are seen to be never concomitant nor constant when more than one collection is observed. Moreover, the Nuttallian specimens seen by me do not agree with Rydberg's characterization. For instance, he describes *A. simplicifolius*, Fl. Ry. Mts. 509, as having leaves "not pungent." Those of Nuttall's specimen are distinctly so. Similarly, the bracts of *H. brachycarpus* are quite as slender and scarious as those of *A. caespitosus*. Curiously enough, Rydberg makes no mention of *H. canescens* Nutt. which was published with *H. caespitosus* and *H. brachycarpus*.

2. A. DETRITALIS Jones, Contrib. W. Bot. xiii. 9 (1910). *Homalobus detritalis* (Jones) Rydb. Fl. Ry. Mts. 511 (1917).—UTAH.—Not seen by me.

3. A. LANCEARIUS Gray, Proc. Am. Acad. xiii. 370 (1878).—Northern Arizona to Utah and probably Colorado.—ARIZONA: Beaver Dam, 1877, *Palmer*, 114.

Jones, Contrib. W. Bot. x. 64 (1902), reduces this species to the next. Both are represented in the Gray Herbarium by the type material only, from which they appear to be distinct by the characters indicated, although closely related.

4. A. EPISCOPUS Wats., Proc. Am. Acad. x. 346 (1875). *Homalobus episcopus* (Wats.) Rydb. Bull. Torr. Club, xl. 53 (1913).—SOUTHERN UTAH: 1873. *F. M. Bishop.*

5. A. BOURGOVII Gray, Proc. Am. Acad. vi. 227 (1864). *Homalobus Bourgovii* (Gray) Rydb. Mem. N. Y. Bot. Gard. i. 247 (1900). —Alberta to British Columbia and south to northern Idaho, Montana and South Dakota.—ALBERTA: Sheep Mountain, *John Macoun*, 10,190; head of Lake Louise, *John Macoun*, 65,084; Mount Paget, *John Macoun*, 65,082. MONTANA: McDonald's Peak, *Canby*, 87; Summit, July 24, 1894 *Williams;* Belt Mts., *Williams*, 747. IDAHO: Stevens Peak, *Leiberg*, 1470. BRITISH COLUMBIA: Kootenay Pass, Aug. 15, 1881, *Dawson;* Summit of Rocky Mts., *John Macoun*, 26. "Rocky Mountains on the British Boundary," 1858, *E. Bourgeau.*

6. A. PAUCIFLORUS Hook. Fl. Bor. Am. i. 149 (1838). *A. vexilliflexus* Sheld. Minn. Bot. Stud. i. 121 (1894). *Homalobus vexilliflexus* (Sheld.) Rydb. Mem. N. Y. Bot. Gard. i. 249 (1900). *A. amphidoxus* Blank. Mont. Agric. Col. Sci. Stud. i. 72 (1905). *Homalobus miser* Rydb. Fl. Ry. Mts. 511 (1917), not Dougl.—Northern Wyoming to Saskatchewan and British Columbia.—ALBERTA: Belly River, *John Macoun*, 10,202; Pipestone Pass, *John Macoun*, 65,083. MONTANA: Skyhigh, Unionville, July 10, 1898, *E. N. Brandegee;* Shield's River, *Scribner*, 27; Bozeman, *Canby*, 82; Bridger Mts., *Rydberg & Bessey*, 4486. WYOMING: Soda Butte, *A. & E. Nelson*, 5873. BRITISH COLUMBIA: heights above Carbonate Draw, *Hencock*, 351.

A. miser Dougl., Hook. Fl. Bor. Am. i. 153 (1838), is the earlier name for *A. microcystis* Gray, Proc. Am. Acad. vi. 220 (1864) as indicated by Jones, Contrib. W. Bot. viii. 9 (1898), and by Piper, Contrib. U. S. Nat. Herb. xi. 373 (1906). *Homalobus miser* Rydb., Bull. Torr. Club, xl. 52 (1913) and Fl. Ry. Mts., is apparently a state of *A. pauciflorus* Hook., at least in large part.

7. A. DEBILIS (Nutt.) Gray, Proc. Acad. Phil. 2. vii. 60 (1863). *Phaca debilis* Nutt. in T. & G. Fl. N. Am. i. 345 (1838). *Homalobus debilis* (Nutt.) Rydb. Bull. Torr. Club, xl. 53 (1913).—Northern Colorado to Wyoming, Idaho and northern Canada.—COLORADO: North Park, *Osterhout*, 3; Upper Platte, *Geyer*, 3.

8. A. WINGATANUS Wats. Proc. Am. Acad. xviii. 192 (1883).

Homalobus wingatanus (Wats.) Heller, Muhl. i. 145 (1906). *H. wingatensis* Rydb. Bull. Torr. Club. xxxi. 563 (1904).—Western New Mexico and adjacent Arizona to Colorado and Utah.—COLORADO. Naturita, *Payson*, 304; Mancos, *Baker, Earle & Tracy*, 78. NEW MEXICO: Fort Wingate, *Matthews*, 7 & 15; "New Mexico," *Palmer*, 14 & 61.

9. A. DODGEANUS Jones, Zoe, iii. 289 (1893). *Homalobus Dodgeanus* (Jones) Rydb. Bull. Torr. Club. xl. 52 (1913).—Utah and southwestern Colorado.—COLORADO: Grand Junction, May 22, 1895, *Jones*. UTAH: Thompson's Springs, June 17, 1913, *Jones*.

10. A. TENELLUS Pursh, Fl. Am. Sept. ii. 473 (1814). *Homalobus tenellus* (Pursh) Britton, Britton & Brown, Illus. Fl. ii. 305 (1897). *Orobus dispar* Nutt. Gen. ii. 95 (1818). *H. dispar* Nutt. in T. & G. Fl. N. Am. i. 350 (1838). *H. stipitatus* Rydb. Bull. Torr. Club, xxxiv. 419 (1907).—From New Mexico and Nevada to northern Canada and east to Nebraska and Minnesota.—NORTH DAKOTA: Devil's Lake, June 29, 1902, *Lunell*. SOUTH DAKOTA: Bull Springs, *Rydberg*. 632. ASSINIBOIA: Medicine Hat, *John Macoun*, 4200. SASKATCHEWAN: Herzel, *Macoun & Herriot*. 70,486. ALBERTA: Red Deer Valley, *Moodie*, 960. MONTANA: valley of Blackfoot River, *Canby*, 83. IDAHO: Clyde, *Macbride & Payson*, 3112. WYOMING: Dubois, *Nelson*, 751; C. Y. Horse Ranch, *Goodding*, 244. COLORADO: near Empire, *Patterson*, 182; Idaho Springs, *Jones*, 687. UTAH: P. V. Junction, Aug., 1883, *Jones*. NEW MEXICO: Santa Fé, *Rothrock*, 40.

Only a few representative collections of this somewhat variable species have been cited. I am unable to distinguish even varietally *H. dispar* Nutt. and *H. stipitatus* Rydb. recognized by Rydberg, Fl. Ry. Mts. 509 and 512. He maintains the former because of the short stipe and "oblong to oval" leaflets. Nuttall's specimen in the Gray Herbarium has narrowly linear leaflets and the stipe of even very immature pods is quite as long as the calyx. *H. stipitatus*, characterized as having "narrowly linear" leaflets and a stipe exceeding the calyx, is limited as to range to "Sask.–Mina. S. D." The material seen by me from this territory has broadly oblong leaves and exhibits great variation in the development of the stipe. Furthermore, the pods of a Wyoming specimen are borne on stipes that somewhat exceed the calyx. A form of the species with pubescent pods occurs in Utah and Nevada which may be known as A. TENELLUS Pursh, forma **strigulosus** (Rydb.), comb. nov. *Homalobus strigulosus* Rydb. Bull. Torr. Club, xxxiv. 420 (1907).—Utah and Nevada.—NEVADA: E. Humboldt Mts., *Watson*, 285.

10a. A. TENELLUS Pursh, var. **Clementis** (Rydb.), comb. nov. *Homalobus Clementis* Rydb. Bull. Torr. Club, xxxi. 563 (1904).—Colorado and New Mexico.—COLORADO: Marshall Pass, *Baker*, 489. NEW MEXICO: Ponchuelo Creek, *Standley*, 4181.

Rydberg contrasts this plant with *A. wingatanus*. The pods however are distinctly though shortly stipitate, and accordingly, notwithstanding the purplish flowers, the plant is allied to *A. tenellus*. which it resembles closely in habit. Besides the difference in the color of the corolla the variety *Clementis* can be distinguished from the typical form of *A. tenellus* by the pubescent and very shortly stipitate pods. The specimen cited from New Mexico has pods on longer stipes than exhibited on cotype material from Colorado which suggests that this plant is better treated as a variety than as a distinct species. Furthermore, specimens of *A. tenellus* with glabrous pods on well-developed stipes occasionally have purple instead of yellowish corollas. This color form may be known as A. TENELLUS Pursh, forma **acerbus** (Sheld.), comb. nov. *A. acerbus* Sheld. Minn. Bot. Stud. i. 123 (1894). *Homalobus acerbus* (Sheld.) Rydb. Bull. Torr. Club, xxxii. 666 (1906).

11. A. CAMPESTRIS (Nutt.) Gray, Proc. Am. Acad. vi. 229 (1864). *Homalobus campestris* Nutt. in T. & G. Fl. N. Am. i. 351 (1838). *H. junceus* Nutt. l. c. *A. junceus* (Nutt.) Gray, l. c. 230. *A. juniciformis* A. Nels. Bull. Torr. Club, xxvi. 9 (1899). *H. juniciformis* (A. Nels.) Rydb. Bull. Torr. Club, xxxii. 666 (1906). *A. diversifolius* Gray, var. *roborum* Jones, Contrib. W. Bot. x. 61 (1902).—Wyoming to Colorado, Utah and Arizona.—WYOMING: Fort Steele, *Nelson*, 4839; Leucite Hills, *Merrill & Wilcox*, 468; Gros Ventre River, *Nelson*, 1086; northwestern Wyoming, *Parry*, 80. COLORADO: White River, 1878, *Mrs. Danforth*. UTAH: Parley's Peak, *Watson*, 288; southern Utah, *Mrs. Thompson:* Salt Lake City, *Garrett*, 984. NEVADA: Cave Creek P. O., *Heller*, 9500.

11a. A. CAMPESTRIS (Nutt.) Gray, var. **diversifolius** (Gray), comb. nov. *A. diversifolius* Gray, Proc. Am. Acad. vi. 230 (1864).—Montana to Colorado, west to Utah and Idaho.—MONTANA: Helena, *Canby*. 84. IDAHO: Tikura, *Nelson & Macbride*, 1292; Clyde, *Macbride & Payson*, 3183; Beaver Cañon, *Watson*, 92; Picabo, *Macbride & Payson*, 2993. WYOMING: sources of the Platte, *Nuttall*. COLORADO: South Fork of Platte, *Geyer*. 2; Middle Park, 1864, *Parry;* Cedar Edge, *Baker*, 242. UTAH: Uintah, *Jones*, 1831; Salt Lake City, *Garrett*, 1776; Magna, *W. W. Jones*, 166.

I have reached the conclusion that *H. junceus* Nutt. and *H. cam-*

pestris Nutt. are phases of but one species by examination of Nuttall's material in the Gray Herbarium in conjunction with the specimens cited above. The relative length of the calyx-lobes, and the presence or absence of black pubescence seem to me to be trivial variations not concomitant with other characters and of no practical taxonomic value.

12. **A. Garrettii**, nom. nov. *Homalobus paucijugus* Rydb. Bull. Torr. Club, xxxiv. 418 (1907), not *A. paucijugus* Schrenk, Bull. Phys. —Math. Acad. Petersb. ii. 196 (1844).—Utah.—Big Cottonwood Canyon, *Garrett,* 1580, in part.

13. A. DIVERGENS Blank. Mont. Agric. Col. Sci. Stud. i. 73 (1905). *Homalobus tenuifolius* Nutt. in T. & G. Fl. N. Am. i. 351 (1838), not *A. tenuifolius* Desf. Fl. Atl. ii. 186 (1800). *H. camporum* Rydb. Bull. Torr. Club, xxxii. 666 (1906).—Wyoming to Idaho, Utah and Colorado.—IDAHO: Howe, *Macbride & Payson,* 3106; Beaver Cañon, *Watson,* 91. COLORADO: Dry Sandy, June 22, 1873, *Parry.* WYOMING: "Colorado of the West," *Nuttall;* northwestern Wyoming, *Parry,* 81; Medicine Bow, *Nelson,* 9648; Bush Ranch, *Nelson,* 7085; Laramie Hills, *Nelson,* 198; Birds Eye, *Nelson,* 9359; Leckie, *Merrill & Wilcox,* 537 & 585; Alcova, *Goodding,* 146; Mammoth Hot Springs, *A. & E. Nelson,* 5649. UTAH: Big Cottonwood Canyon, *Garrett,* 1580, in part.

14. **A. Carltonii**, nom. nov. *Homalobus humilis* Rydb. Bull. Torr. Club, xxxiv. 417 (1907), not *A. humilis* Bieb. Fl. Taur. Cauc. ii. 203 (1808).—Utah.—near Marysvale, *Rydberg & Carlton,* 7147; Delano Peak, *Rydberg & Carlton,* 7219; Alta, *Jones,* 1210.

15. A. DECUMBENS (Nutt.) Gray, Proc. Am. Acad. vi. 229 (1864). *Homalobus decumbens* Nutt. in T. & G. Fl. N. Am. i. 352 (1838). *H. microcarpus* Rydb. Bull. Torr. Club, xxxiv. 417 (1907)?—Colorado and Wyoming.—WYOMING: Wood's Creek, *Goodding,* 1429; Platte, *Nuttall.* COLORADO: 1862, *Hall & Harbour,* 142 in part; 1862, *Parry,* 435; Como, *Crandall & Cowen,* 131.

Nuttall's material of this species in the Gray Herbarium consists of a single stem and one mature legume. The specimen is not exactly duplicated by any others I have seen, but the material cited cannot be referred to another species, unless to *H. microcarpus* Rydb. which I know only from description.

16. A. HYLOPHILUS (Rydb.) A. Nels. in Coult. & Nels. New Man. Ry. Mt. Bot. 291 (1909). *Homalobus hylophilus* Rydb Mem. N. Y. Bot. Gard. i. 247 (1900).—Montana to Utah. —MONTANA: Bridger Mts., *Rydberg & Bessey,* 4490; Bozeman, *W. W. Jones.* WYOMING:

Yellowstone Lake, *A. & E. Nelson*, 6627. UTAH. Dyer Mine, *Goodding*, 1321.

16a. A. HYLOPHILUS (Rydb.) A. Nels., var. **oblongifolius** (Rydb.), comb. nov. *Homalobus oblongifolius* Rydb. Bull. Torr. Club, xxxiv. 50 (1907).—Wyoming and Colorado.—WYOMING: Union Pass, *Nelson*, 869; Teton Pass Mts., *E. B. & L. B. Payson*, 2068. COLORADO: Leadville, July, 1884, *Jones;* Cerro Summit, *Baker*, 409; Pinkham Creek, *Goodding*, 1472.

17. **A. Rydbergii**, nom. nov. *Homalobus decurrens* Rydb. Bull. Torr. Club, xxxi. 563 (1904), not *A. decurrens* Boiss. Diagn. Ser. 1. vi. 40 (1845).—Colorado.—Jefferson Co., *Clokey*, 3808; 1862, *Hall & & Harbour*, 142, in part; Golden City, 1870, *Greene*.

18. A. SEROTINUS Gray, Pac. R. Rep. xii. 51 (1860). *Homalobus serotinus* (Gray) Rydb. Mem. N. Y. Bot. Gard. i. 248 (1900).—Washington, British Columbia and Montana (?).—WASHINGTON: on the Okanagan, *Cooper;* Peshastin, *Sandberg & Leiberg*, 473; 1889, *Vasey*, 273. BRITISH COLUMBIA: Armstrong, *Wilson*, 133; between Kettle and Columbia River, *J. M. Macoun*, 63,752.

18a. A. SEROTINUS Gray, var. **strigosus** (Coult. & Fish.), comb. nov. *A. strigosus* Coult. & Fish. Bot. Gaz. xviii. 299 (1893). *Homalobus strigosus* (Coult. & Fish.) Rydb. Bull. Torr. Club, xl. 53 (1913). *A. griseopubescens* Sheld. Minn. Bot. Stud. i. 126 (1894).—Montana and Washington.—MONTANA: Columbia Falls, July 12, 1894, *Williams*. WASHINGTON: near Spokane and Columbia Rivers, *Geyer*, 475; 1860, *Lyall*.

18b. A. SEROTINUS Gray, var. **Palliseri** (Gray), comb. nov. *A. Palliseri* Gray, Proc. Am. Acad. vi. 227 (1864). *Homalobus Palliseri* (Gray) Rydb. Mem. N. Y. Bot. Gard. i. 248 (1900).—Montana, Washington, Alberta, British Columbia and apparently Utah.—MONTANA: Old Sentinal, *MacDougal*, 168. WASHINGTON: Walla Walla, *Brandegee*, 733. ALBERTA: Squaw Mt., *Barber*, 279; Banff, *Butters & Holway*, 12. BRITISH COLUMBIA: Columbia Valley, *John Macoun*, 1; Selkirk, *Shaw*, 241; Sophie Mt., *J. M. Macoun*, 63,756. UTAH: Uinta, *Watson*, 287?

This species is closely related indeed to the more southern *A. hylophilus* to which it may pass through the var. *Palliseri*, but the typical forms are clearly distinct.

19. A. STENOPHYLLUS T. & G. Fl. N. Am. i. 329 (1838). *Homalobus stenophyllus* (T. & G.) Rydb. Mem. N. Y. Bot. Gard. i. 249 (1900).—Nevada to Montana and British Columbia.—Specimens of this common and characteristic species need not be noted.

20. A. Coltoni Jones, Zoe, ii. 237 (1891). *Homalobus episcopus* Rydb. Fl. Ry. Mts. 514 (1917), not *A. episcopus* Wats.—Utah, Colorado and New Mexico.—Colorado: Naturita, *Payson*, 336. New Mexico: Carrizo Mts., May & June, 1892, *Matthews*.

Rydberg's reduction, l. c., of this species to *A. episcopus*, a plant with strictly sessile pods, is not understandable.

21. A. collinus Dougl. in G. Don, Gen. Syst. ii. 256 (1832).—Oregon to western Idaho and British Columbia.—Collections of this rather common species are regularly determined correctly.

22. **A. curvicarpus** (Sheld.) comb. nov. *A. speirocarpus* Gray, var. *curvicarpus* Sheld. Minn. Bot. Stud. i. 125 (1894). *Homalobus curvicarpus* (Sheld.) Heller, Muhl. ii. 86 (1905). *A. speirocarpus* Gray, var. *falciformis* Gray, Bot. Calif. i. 152 (1880), not *A. falciformis* Desf. ex DC. Astrag. 176 (1802). *A. Gibbsii* Kell., var. *falciformis* (Gray) Jones, Contrib. W. Bot. viii. 23 (1898).—Washington to California and Idaho.—Idaho: New Plymouth, *Macbride*, 75; Shoshone Falls, *Nelson & Macbride*, 1839. Nevada: Toyabe Mts., *Watson*, 282. California: Fall River Mills, *Hall & Babcock*, 4252; Sierra Co., *Lemmon*, 621; Grenada Station, *Heller*, 8066; west of Amedee, June 24, 1897, *Jones*. Oregon: Barren Valley, *Leiberg*, 2187; Rock Creek, *Leiberg*, 66; Otis Creek, *Leiberg*, 2332; eastern Oregon, May 20, 1898, *Cusick*, 1878; Antelope, *Howell*, 387; Steins Mt., *Howell*, 381; Narrows, *Peck*, 3020.

A. Gibbsii Kell. is closely related to this species but I have seen no intermediate specimens. *A. Gibbsii*, furthermore, occurs only in extreme western Nevada and adjacent California. The species may be contrasted as follows:

Calyx-teeth 2.5–3.5 mm. long; pods turgid, coriaceous; stipes little exceeding the calyx; pubescence soft, spreading ..... *A. Gibbsii.*

Calyx-teeth 1–1.5 mm. long; pods little turgid, subcoriaceous; stipes long-exserted; pubescence strigillose, subappressed ..... *A. curvicarpus.*

23. A. Hallii Gray, Proc. Am. Acad. vi. 224 (1864). *Homalobus Hallii* (Gray) Rydb. Bull. Torr. Club, xxxii. 667 (1913).—Colorado.—Middle Park, 1875, *Patterson;* Como, *Crandall & Cowen*, 134; South Park, *Hughes*, 2; 1862, *Hall & Harbour*, 121; McCoy, *Shear & Bessey*, 1345.

24. A. Fendleri Gray, Pl. Wright. ii. 44 (1853). *Phaca Fendleri* Gray, Pl. Fendl. 36 (1840). *Homalobus Fendleri* (Gray) Rydb. Bull. Torr. Club, xxxii. 667 (1906).—Colorado and New Mexico.—Colorado: Black Cañon, *Baker*, 376; Apex, *Wolf & Rothrock*, 226; Los

Pinos, *Baker*, 425; Boulder City, 1862, *Parry*. New Mexico: Los Pinos, *Baker*, 411; between Santa Fé and Canoncito, *A. A. & E. Gertrude Heller*, 3783; between Santa Fé and Pecos, *Fendler*, 157.

25. A. FLEXUOSUS Dougl. in G. Don, Gen. Syst. ii. 256 (1832). *Phaca flexuosa* Hook. Fl. Bor. Am. i. 140 (1833). *Homalobus flexuosus* (Dougl.) Rydb. Bull. Torr. Club, xxxii. 666 (1906). *H. proximus* Rydb. Bull. Torr. Club, xxxii. 667 (1906)? *H. Salidae* Rydb. l. c. ? *A. proximus* (Rydb.) Woot. & Standl. Contrib. U. S. Nat. Herb. xix. 366 (1915) ?—Saskatchewan to New Mexico, Utah, and Alberta.

I have not seen authentic material of either *H. proximus* Rydb. or *H. Salidae* Rydb. but from description these segregates possess no characters that are not evident in varying degree in the large series of specimens I have seen of this common species.

26. A. LONCHOCARPUS Torr. Pac. R. Rep. iv. 80 (1857). *Phaca macrocarpa* Gray, Pl. Fendl. 36 (1849), not *A. macrocarpus* DC. Astrag. 143 (1802). *Homalobus macrocarpus* (Gray) Rydb. Bull. Torr. Club, xxxii. 667 (1906). *A. macer* A. Nels. Bot. Gaz. lvi. 65 (1913).—Utah and Colorado to New Mexico.—Colorado: Paradox, *Walker*, 179; Durango, *Crandall*, 4; Pagosa Springs, *Baker*, 416; Naturita, *Payson*, 314. Utah: 1874, *Parry*, 52. New Mexico: Santa Fé, *A. A. & E. Gertrude Heller*, 3604; also *Fendler*, 160.

V. VARIOUS NORTH AMERICAN SPERMATOPHYTES, NEW OR TRANSFERRED.

By J. Francis Macbride.

✓CLEOME LUTEA Hook., var. **Jonesii**, var. nov., staminibus 6 didynimis, eorum 4 brevioribus 2 cm. longis sed 2 ceteris longioribus 3 cm. longis; siliqua lineari-fusiformi circa 4 cm. longa, medio circa 2 mm. lata vix haud torulosa, matura stipite circa 2.5 cm. longo praedita; corolla aurea.—Arizona. Verde Valley, July 24, 1920, *W. W. Jones*, 168 (TYPE, Gray Herb.).

In view of the considerable variation displayed in a series of specimens of *C. lutea* it seems best to regard this plant with extremely long filaments and pods as only a variety. The flowers, however, appear to be of a brighter yellow than those of the typical form. The specimen belongs to a small collection of plants, chiefly Arizonan,

made in 1920 by Mr. W. W. Jones, who revised the genus *Zeamenia*.

LOTUS TORREYI (Gray) Greene, var. **seorsus**, var. nov., plus minusve adpresse hirsutulus; caulibus gracilibus erectis vel adscentibus; foliolis fere glabris, rare 1.5 cm. longis, 5 mm. latis, apice rotundatis, abrupte cuspidatis; pedunculis 2–4-floris; corolla circa 1 cm. longa.—CALIFORNIA: near the stream, Idlewild, San Jacinto Mts., June 28, 1919, *Mary F. Spencer*, 1280 (TYPE, Gray Herb.).

Parish, Plant World, xx. 220 (1917), referred specimens secured in the San Bernardino Mountains to *L. Torreyi* without comment. These probably are the same as Mrs. Spencer's which differ sufficiently from the typical form of the species as it occurs in the central Sierra Nevada to be accorded varietal recognition. The southern plant is less pubescent, the pubescence hirsutulous rather than villous, the smaller leaflets are much more abruptly cuspidate and the peduncles bear fewer and smaller flowers. Usually, too, the variety is less robust. If it were not for the presence of intermediate forms in which all of these characters are seen to vary the variety *seorsus* would merit specific rank.

For a discussion regarding the recent delimitation of the genus *Lotus*, see Contrib. Gray Herb. liii. 14 (1918).

MENTZELIA LAEVICAULIS (Dougl.) T. & G., var. **acuminata** Nels. & Macbr., in herb. *Nuttallia acuminata* Rydb. Bull. Torr. Club, xl. 61 (1913).

In a large series of specimens I have been unable to see any constant coordination of the characters upon which Dr. Rydberg segregated, l. c., *N. acuminata*. The "pubescent, duller stem" may or may not be associated with long-acuminate upper stem-leaves with "broad almost subhastate bases." For instance, Suksdorf's no. 175 from Park County, Montana, is pubescent-stemmed but even the uppermost leaves are narrow. And surely the upper leaves of Cotton's no. 808 from the Yakima region of Washington, are quite as broad at the base and as long-acuminate as those of W. W. Jones' no. 430 from Bacchus, Utah, although the former specimen has a smooth lustrous stem while that of the latter is finely pubescent and dull.

Furthermore, all of the Californian material referred to *M. laevicaulis* by Urban and Gilg, and other authorities, is not smooth-stemmed. And indeed this Californian material does not seem distinguishable from specimens cited by Rydberg, l. c., as representing *N. acuminata*, which therefore is not "lacking in California." *M. acuminata*, therefore appears to be merely a form with pubescent stems that approximates the range of the typical state but that

replaces it, at least largely, in Wyoming and Montana. Accordingly it may be assigned varietal rank.

Mentzelia parviflora (Dougl.), comb. nov. *Bartonia parviflora* Dougl. ex Hook. Fl. Bor. Am. i. 221 (1834). *Nuttallia parviflora* (Dougl.) Greene, Leaflets, i. 210 (1906).

Rydberg, Fl. Ry. Mt. 572 (1917), refers to this species, with a question, *M. Brandegei* Wats. The only specimen I have seen of the latter is the type from "Washington Territory" and it seems very distinct by virtue of the fewer stamens (only about 35) and the narrow almost pinnately dissected leaves. *M. parviflora* resembles *M. laevicaulis*, var. *acuminata* except that the flowers are much smaller and the leaves more remotely toothed.

In spite of the presence of the name *M. parviflora* Heller, Bull. Torr. Club, xxv. 199 (1898), I am taking up Douglas's name on the ground that Heller's species is "universally regarded as non-valid" (Art. 50, Int. Rules Bot. Nomencl.). Exception to this may be taken, however, as Wooton and Standley, Contrib. U. S. Nat. Herb. xix. 435–436 (1915) recognized it although remarking, "close to" *M. albicaulis*. However, they maintained the name under the segregate genus *Acrolasia* and no authority has given Heller's species any standing under *Mentzelia*. The name "*parviflora*," therefore, seems to me available for the plant of Douglas.

Opuntia compressa (Salisb.), comb. nov. *Cactus Opuntia* L., Sp. Pl. 468 (1753). *C. compressus* Salisb. Prod. 348 (1796). *O. Opuntia* (L.) Karsten, Deutsch. Fl. 888 (1882).

In accordance with Art. 55, 2 of the International Rules of Botanical Nomenclature which reads, "Specific names must also be rejected when they merely repeat the generic name" the above new combination is necessary. As the word "compressus" has not before been used as a specific cognomen in *Opuntia*, Salisbury's name is available.

Oenothera Abramsi, nom. nov. *Sphaerostigma pallidum* Abrams, Bull. Torr. Club, xxxii. 539 (1905), not *O. pallida* Lindl. Bot. Reg. t. 1142 (1828).

Mrs. Mary F. Spencer has secured a series of specimens of this xerophilous species, which is well differentiated from other related members of the subgenus *Sphaerostigma* by the uniformly appressed pubescence and relatively small flowers.

Oenothera erythra (Davidson), comb. nov. *Sphaerostigma erythra* Davidson, Bull. South. Calif. Acad. Sci. i. 118, pl. 9 (1902).

Although I have seen no authentic material of Dr. Davidson's species, I refer to it with but little hesitation Mrs. Spencer's number

1465 from Palm Canyon, Colorado Desert, California, secured April 7, 1920.

COELOPLEURUM LUCIDUM (L.) Fernald, Rhodora, xxi. 146 (1919). *C. Gmelini* (DC.) Ledeb. Fl. Ross. ii. 361 (1844). *C. maritimum* Coult. & Rose, Bot. Gaz. xiii. 145 (1888). *C. longipes* Coult. & Rose, Contrib. U. S. Nat. Herb. vii. 142 (1900).

The attempt to determine an excellent specimen of *Coelopleurum* collected at Harbor, Curry County, Oregon, July 10, 1919, by Prof. Morton E. Peck has brought to light the fact that the genus is monotypic instead of consisting "of 4 or 5 species belonging to the northern coasts of North America and adjacent Asia," as stated by Coulter and Rose, l. c. 141.

Study of the large amount of material in the Gray Herbarium and in the herbarium of the New England Botanical Club shows conclusively that the character "fruit with equal ribs," used by Coulter and Rose to distinguish the plant of the northeastern coast from that of the northwestern, breaks down completely. Specimens from both coasts have fruits with the lateral ribs distinctly broader than the others; and also every gradation from ribs very unequal to ribs equal in size may be observed. Coulter and Rose recognize three species on the western coast, distinguishing them from each other by the size of the fruit and the "obtuse" and "acute or acuminate" leaflets. Clearly if these are valid characters there are several species on the eastern coast as well. For there the same variation in the size of the fruits and the degree to which the leaflets are acute is evident in a large series of specimens.

Prof. Fernald has called my attention to the fact that there is no reason to expect, from a standpoint of range, the western and eastern plants to differ. The range is, in fact, analogous to that of many plants, notably *Elymus arenarius*, var. *villosus*, *Lathyrus maritimus*, *Mertensia maritimus*, *Carex maritimus*, *C. norvegica*, *Poa eminens*, *Senecio pseudo-arnica*, and others. It is interesting to add this showy umbelliferous species to the list.

Gomphocarpus Torreyi, nom. nov. *Gomphocarpus tomentosus* (Torr.) Gray, Bot. Calif. i. 477 (1876), not *G. tomentosus* Buch. Trav. i. 543 (1822).

GOMPHOCARPUS TORREYI Macbr., var. **Xanti** (Gray), comb. nov. *Gomphocarpus tomentosus* (Torr.) Gray, var. *Xanti* Gray, Bot. Calif. i. 477 (1876).

It seems strange that no one has observed that the name *tomentosus* was used for an African species (which is valid) long before

this not uncommon *Gomphocarpus* of southern California was discovered. My attention has been called to this in determining some excellent specimens of the species secured by Mrs. Mary F. Spencer at Mesa Grande, San Diego County, in May, 1919.

PHACELIA VISCIDA (Benth.) Torr., forma **albiflora** (Nutt.), comb. nov. *Eutoca albiflora* Nutt., Journ. Acad. Nat. Sci. Phil. Ser. 1. ii. 158 (1848). *P. viscida* (Benth) Torr., var. *albiflora* (Nutt.) Gray, Syn. Fl. ii. 1. 163 (1878.)

My attention has been called to this species by a specimen in a set of California plants received from Mr. W. N. Suksdorf. As it differs from the typical state of the species, with which it may sometimes grow, only in the white corollas, formal rather than varietal designation seems to be more fitting.

ALLOCARYA STIPITATA Greene, var. **micrantha** (Piper), comb. nov. *A. stipitata* Greene, subsp. *micrantha* Piper, Contrib. U. S. Nat. Herb. xxii. 94 (1920).

I have discussed the distinctness of the categories variety and subspecies in Contrib. Gray Herb. lix. 1 (1919). Since the plant treated by Piper as a subspecies of *A. stipitata* differs only in the smaller corolla it seems to me not more than a variety.

Piper's revision of *Allocarya* is one of the finest consummated in this family. He may be said to have discovered the specific characters, since, even though to some extent recognized, they have never before been consistently described for each species. Certainly these characters, minute as they are and mostly of the fruit, are remarkably constant, in this respect suggesting those of *Cryptantha* and *Oreocarya*. Thus is added a third genus in this family, as it occurs in western North America, the species of which are often scarcely, if at all, distinguishable by vegetative characters.

Mr. Willard N. Clute, editor of a magazine, "The American Botanist," comments in the May issue, 1920 (page 65) on Piper's revision. Mention is made of this in order that some toiling taxonomist may find delightful relaxation in reading Mr. Clute's paragraph.

SOLANUM XANTI Gray, var. **Spencerae**, var. nov., habitu ignotum. ramulis superioribus viridibus, ut videtur glabris, non patentibus; corollis albis. solum 1.5 cm. latis.—CALIFORNIA: Torrey Pines, near San Diego, March 28, 1919, *Mary F. Spencer* (TYPE, Gray Herb.).

Mrs. Spencer's label records the flowers of this interesting variant as "snow white." The aspect of the specimens is similar to that of the var. *glabrescens* Parish but the corollas are much smaller (and white);

and if one may judge from the way in which the upper branches are borne the habit of the plant is much more compact than is the case with the variety *glabrescens*.

✓ CASTILLEJA DOUGLASII Benth., var. **contentiosa**, var. nov., foliis numerosis cinereo-viridibus scabrido-pubescentibus nunc integris nunc trifidis; calyce 19–21 mm. longo antice et postice subaequaliter lobis apice dentatis obtusis; corolla 20–24 mm. longa, tubo circa 1 cm. longo, galea calycem paululum superanti; labii lobis circa .75 mm. longis.—CALIFORNIA: hill near Lompoc, June 11, 1913, *Suksdorf*, 94 (TYPE, Gray Herb.); Gaviota, May 1, 1908, *Eastwood*, 57; country adjacent to Santa Barbara, May 16, 1908, *Eastwood*, 136.

The obvious difference between this variety, apparently restricted to Santa Barbara County, and the typical form of the species is the very scabrous pubescence which is sufficiently dense to give an ashy hue to the foliage. Also, in the specimens examined, the corolla, in proportion to the calyx, is shorter than in true *C. Douglasii*, but this character belongs likewise to *C. Wrightii* Elmer, Bot. Gaz. xli. 322 (1906) which appears to be another variety, not as distinct, however, as var. *contentiosa*. Indeed the disposition of the latter is perplexing but its relationship is surely here. Now, at least, *C. Douglasii* seems to be the proper name for the rather common Indian Paint Brush of western California. Jepson's treatment of it in Fl. W. Middle Cal. 402 (1901) as merely a variety of *C. parviflora* Bong., of Alaska, well-defined by Fernald, Erythea, vi. 41, 43 (1898), is radical. Rather must it be compared with the variable *C. angustifolia* (Nutt.) G. Don typically of the Rocky Mountains and the northwestern United States.

SOLIDAGO RIGIDA L., var. HUMILIS Porter, Syn. Fl. Colo. (Dept. Int. Misc. Publ. 4) 63 (1874). *Oligoneuron canescens* Rydb. Bull. Torr. Club, xxxi. 652 (1904).

My attention has been called to this well-marked species by the receipt of an excellent specimen from Mr. I. W. Clokey. The label accompanying the material reads: "3901 Oligoneuron canescens Rydb. Dry soil, Jefferson Co., Colorado."

Dr. Rydberg, l. c., in segregating the Rocky Mountain plant from typical *S. rigida*, distributed from the Atlantic states to the Great Plains, mentioned one difference only that obviously was not one of degree, viz., the presence of a few hairs at the summit of the achene. The achenes of the eastern state of the species are, indeed, uniformly glabrous throughout, but some western material, notably, Aven Nelson's no. 8638 from Platte Canyon, Wyoming, has glabrous achenes although the foliage is densely pubescent, the plant in this

respect according with *O. canescens*. Furthermore, it becomes evident, upon examination of many specimens, that the amount of pubescence at the summit of the achenes varies. Accordingly the western form of *S. rigida* appears at most to be a variety, distinguishable, but with no constant character. The smooth achenes of some specimens probably accounts for the suppression by Nelson, Coulter & Nelson, New Man. Ry. Mt. Bot. 507 (1909) of Porter's varietal name, a course certainly less open to censure than Rydberg's treatment which may be said to be fantastic in that even the convenient and logical expression of the group relationship is lost by the maintenance of *Oligoneuron* Small, Fl. S. E. U. S. 1188 (1903).

Lepachys columnifera (Nutt.), comb. nov. *Rudbeckia columnifera* Nutt. Fraser's Cat. no. 75 (1813). *R. columnaris* Pursh, Fl. Am. Sept. 575 (1814), or Sims, Bot. Mag. t. 1601 (1814). *L. columnaris* (Pursh) T. & G. Fl. N. Am. ii. 315 (1842). *Ratibida columnifera* (Nutt.) Woot. & Standl. Contrib. U. S. Nat. Herb. xix. 706 (1915).

The diagnosis of *R. columnifera* is meager but since the identity of the plant is not open to question, the specific name is to be taken up. In accordance with Art. 38 of the International Rules of Botanical Nomenclature, *Lepachys* Raf. Journ. Phys. lxxxix. 100 (1819), although a later name than *Ratibida* Raf. Am. Monthly Mag. ii. 268 (1818), is retained since the latter was published "without diagnosis or reference to a former description under another name" and therefore "is not valid."

Stephanomeria Wheeleri (Gray) Nels. & Macbr., in herb. *Chaetadelpha Wheeleri* Gray, ex Wats. Am. Nat. vii. 301 (1873). Proc. Am. Acad. ix. 218 (1874).

When Dr. Gray, l. c., proposed his segregate genus *Chaetadelpha* he did so from the view point that "There are so few characters to hold to in the *Cichoriaceae* that we cannot let go those founded on the nature of the pappus. It seems necessary, however undesirable, to admit a third genus of the sort, founded on a single species." The other two genera referred to are *Stephanomeria* and *Lygodesmia*, then, as now, distinguished essentially by the more or less plumose pappus of the former and the eplumose pappus of the latter.

But now that *Stephanomeria* is better known, particularly the variation of *S. exigua*, *Chaetadelpha Wheeleri* is seen to be a species of *Stephanomeria* for its single character, regarded by Dr. Gray as salient, viz. the presence of several bristles toward the base of the pappus, is merely an extreme modification of certain forms of *S.*

exigua in which the pappus-bristles are setulose. *S. Wheeleri* may well constitute yet another section of its genus but its affinity is now so obviously with *Stephanomeria* that its maintenance as a genus for the purpose of holding on to the character that distinguishes this group from *Lygodesmia* is no longer necessary. Apparently Dr. Hall reached this conclusion in 1907 for in describing *Chaetadelpha* in Univ. Calif. Pub. Bot. iii. 260 he wrote: "Similar to *Stephanomeria* with which it is probably congeneric."

VI. RECORDS PRELIMINARY TO A GENERAL TREATMENT OF THE EUPATORIEAE,—II.

By B. L. Robinson.

In the course of recent studies of the Eupatorium Tribe of the *Compositae* the following diagnoses and notes have been prepared for published record.

Eupatorium (§**Subimbricata**) **angulifolium**, spec. nov., subglabrum gracile; caule subcompresso glaberrimo; internodiis aliis brevibus 6–10 mm. longis aliis multo longioribus; foliis oppositis petiolatis suborbicularibus ca. 11-angulatis vel breviter lobatis margine argute cuspidato-dentatis basi sinu clauso cordatis tenuissime membranaceis utrinque viridibus glaberrimis subtus paullo pallidioribus ca. 1 dm. diametro penniveniis levissime reticulato-venulosis; angulis acutiusculis ca. 1 cm. altis; dentibus marginis incisis 2–3 mm. altis, 3–5 mm. latis; sinu basilari usque ad 1.5 cm. alto; petiolis 2.4–4.5 cm. longis obsolete puberulis; eis ejusdem jugi basi anguste connexis; corymbis terminalibus compositis; ramis inflorescentiae gracilibus adscendentibus submudis; bracteis oblanceolatis vix 5 mm. longis; corymbis partialibus 3–6 cm. diametro 6–8-capitulatis; pedicellis subfiliformibus glaberrimis 6–30 mm. longis; capitulis ca. 1–1.2 cm. diametro ca. 75–100-floris; involucri campanulati squamis ca. 50 lanceolatis 3–4-seriatim laxe imbricatis fusco-brunneis striatis acutiusculis minute ciliolatis, maximis ca. 6 mm. longis et 1.3 mm. latis; corollis anguste tubulosis glabris ut videtur albis vel pallidis; tubo proprio ca. 1 mm. longo basim versus dilatato sursum in fauces cylindricas 3 mm. longas vix ampliato; dentibus limbi deltoideis ca. 0.3 mm. longis; achaeniis pallide brunneis 2.5 mm. longis ad angulos sursum scabratis; pappi setis paucis albis tenuissimis caducis corol-

lam subaequantibus.—GUATEMALA: on shady bank, Barranco Hondo, *Salvin & Godman*, 1861, no. 265 (K., phot. and small fragm. Gr.).

This plant appears to be near the still obscure *E. Petasites* Griseb. Ind. Sem. Hort. Goett. 1877, p. 8, a species described from cultivated material supposed to have been raised from Central American seed. So far as can be learned *E. Petasites* has never been rediscovered in nature or precisely located geographically. Even its description is difficult of access since it occurs only in a very rare seed-list. For a careful transcription of this diagnosis the writer is indebted to Prof. L. Diels, Director of the Botanic Garden of Berlin. From this it has been learned that the petioles in *E. Petasites* were longer than the blade, the leaves sinuate-dentate, the leaf-veins depressed above, and the corymbs subtricephalous, while in the plant of Salvin & Godman, here characterized, the petioles are less than half as long as the rather incisely toothed blade; the leaf-veins are distinctly prominulent above and the individual corymbs are 6-8-headed—differences sufficient to remove any likelihood that the plants are conspecific.

E. Arechavaletae Bak. Jour. Bot. xvi. 78 (1878). Through the kindness of Sir David Prain, Director of the Royal Gardens at Kew, there have been recently received for examination at the Gray Herbarium a clear photograph and some characteristic fragments of the type-material of this species. It proved to be a smoothish form of VERNONIA ECHIOIDES Less. Linnaea, iv. 278 (1829), to which species (as was subsequently learned) it had been reduced some years ago by Arechavaleta, Anal. Mus. Nac. Montevid. vi. 120 (1907).

E. BACCHAROIDES HBK. Nov. Gen. et Spec. iv. 132 (1820); Robinson, Proc. Am. Acad. liv. 287 (1918). Material has recently been received which differs from the typical form of this species conspicuously in certain features, yet agrees closely in all the more essential characters. It thus becomes necessary to recognize varieties as follows:

Var. **typicum**, foliis lanceolati-oblongis basi acutiusculis vel acutis 6–8 cm. longis 1.7–2.5 cm. latis; corymbis primo recurvato-nutantibus; eorum ramis pedicellisque glabris.—Lit. synon. exsicc. and range as cited in Proc. Am. Acad. liv. 287 (1918).

Var. **fratri**, var. nov., foliis multo minoribus ovatis vel ovato-lanceolatis basi saepissime rotundatis sed rarius acutiusculis 2–3.5 cm. longis 0.6–1.6 cm. latis; corymbis suberectis vix nutantibus, eorum ramis pedicellisque paullo pilosis; pilis atropurpureis moniliformibus.—COLOMBIA: region of Bogotá, *Bro. Ariste-Joseph* (TYPE, U. S., fragm. Gr.).

E. ELEGANS HBK. Nov. Gen. et Spec. iv. 133 (1820). To the synonymy of this species should be added *E. rorulentum* Robinson, Proc. Am. Acad. liv. 255 (1918). When preparing his revision of the Eupatoriums of Colombia some years ago the writer found in material collected at Guadelupe near Bogotá some immature specimens of a species not previously known or at least recorded from Colombia. Although it exhibited general resemblance to *E. elegans* HBK., some minor differences were visible and it seemed from geographic considerations rather unlikely that there should be specific identity between a species known only locally about Bogotá and another recorded only from southern-central Ecuador. Accordingly the plant from Guadelupe was described as a new species, *E. rorulentum*, being named in reference to the copious shining glands. The recent receipt of further and much more mature material of the Colombian plant has again raised the question of its possible identity with *E. elegans* of Ecuador, especially as the very similar case of the Colombian *E. latipes* Benth. and the Ecuadorean *E. viscosum* HBK., discussed below, had also come to attention. Accordingly characteristic bits of *E. rorulentum* from near Laguna de Verjón, Colombia, collected by Bro. Ariste-Joseph (no. B20) were sent to Paris for comparison. They were there most kindly examined by Prof. H. Lecomte and Father Sacleur, who report them conspecific with *E. elegans*. As two of the Humboldt & Bonpland plants of this group, namely *E. elegans* and *E. viscosum*, attributed by Kunth, though with some obvious uncertainty, to central Ecuador, have not been subsequently collected in or at least reported from that country and as both appear common elements in the flora about Bogotá, it is impossible to escape the inference that there was some confusion in recording the localities of these plants and that they must in fact have been secured by Humboldt and Bonpland during their rather copious collecting about Bogotá and not in their rather hurried travels through Ecuador. In confirmation of this surmise it may be said that the latter country has now for more than a century been traversed by subsequent explorers, including such diligent and acute botanical collectors as Hartweg, Jameson, Eggers, Lehmann, Stübel, Sodiro, Rose, and Holway, none of whom appears to have turned up either of these species.

E. LAEVE DC. Prod. v. 169 (1836). This species appears to vary as follows:

Var. α **typicum**, glaberrimum; foliis ovato-oblongis ca. triplo longioribus quam latis fere a basi pinnatim 3–5-nerviis serratis; dentibus

plerisque acutis plus minusve incurvatis.—Well illustrated by Baker in Mart. Fl. Bras. vi. pt. 2, t. 93 (1876).—BRAZIL: frequent especially in Prov. Rio de Janeiro.

Var. β. INTEGRIUSCULUM Sch.-Bip. ex Bak. l. c. (as *integriuscula*), foliis subintegris.—BRAZIL. Presumably a mere form of the preceding variety.

Var. γ. **pubens**, var. nov., inflorescentiis et axillis nervorum foliorum breviter puberulis; foliis quam apud var. *typicum* paullo latioribus majus ovatis longius a basi pinnatim 5(–7)-nerviis serratis vel crenato-dentatis, dentibus plerumque obtusis.—PARAGUAY: a low tree in bushy woods near Villa Occidental, 7 Feb. 1879, *P. G. Lorentz*, no. 11 (Brl.); Cordillera de Altos, Sep.–Oct. 1902, *K. Fiebrig*, no. 277 (TYPE, Gr.); in region of Lake Ypacaray, Mar. 1913, *E. Hassler*, no. 12,147 (Gr.).

E. (§ **Eximbricata**) **neriifolium**, spec. nov., fruticosum vel arboreum ad 3 m. (Pittier) vel 8 m. (Fendler) altum; cortice brunnescenti-griseo rimoso ad 5 mm. crasso; ligno albescente denso; ramis teretibus glabris pallide brunneis primo dense foliosis tardius denudatis medullosis; internodiis plerisque 1–3 cm. longis; foliis oppositis lanceolato-oblongis utroque attenuatis serrulatis (dentibus vix 0.4 mm. altis ca. 3–4 mm. inter se distantibus) basim versus integris penniveniis 7–12 cm. longis 1.8–2.8 cm. latis supra glabris viridibus minute reticulato-venulosis subtus paullo pallidioribus in costa venisque plus minusve hirsutis; petiolis 5–9 mm. longis ciliatis; paniculis terminalibus corymbiformibus valde convexis ca. 1.5 dm. diametro sordide pubescentibus; bracteis parvis linearibus; capitulis parvis ca. 7.5 mm. longis ad apices ramulorum subsessilibus ca. 7-floris; involucri squamis ca. 11 subherbaceo-brunnescentibus ciliolatis, extimis 3 multo brevioribus, intermediis 5 subaequalibus oblongis obtusis ca. 4 mm. longis et 1.3 mm. latis, intimis ca. 3 angustissimis linearibus paleiformibus; corollis albis glabris; tubo proprio ca. 1.5 mm. longo; faucibus vix ampliatis ca. 2.5 mm. longis; dentibus limbi 5 lanceolatis ad anthesin patente recurvantibus; styli ramis filiformibus vix clavellatis albis; achaeniis brunneis glabris 2.5 mm. longis; pappi setis ca. 27 albis.—VENEZUELA: Colonia Tovar, State of Aragua, alt. 1900–2000 m., 25 Dec. 1921, *Prof. H. Pittier*, no. 9963 (TYPE Gr.); near Colonia Tovar, alt. 1982 m. (6500 ft.), 23 June, 1855, *A. Fendler*, no. 634 (Gr.).

This highly interesting species, which must be one of the tallest and most woody of the genus, has been known to the writer for many years from specimens collected in the middle of the last cen-

tury by Fendler and sent to Dr. Gray under no. 634. At the Gray Herbarium there are three of these sheets. Unfortunately the inflorescences of all were so old as to exhibit only the dried and withered remains of the involucres and not a floret in condition to show the characters needful for certain determination. The plant was doubtfully referred by Dr. Gray to the *Vernonieae*. However it was some years ago transferred by the writer to *Eupatorium* in the Gray Herbarium with a fair degree of confidence that when the flowers were discovered they would show it to be of that genus. A collection recently received from Prof. Pittier has been found to contain excellent material of this species at anthesis and in fact clearly proves it a *Eupatorium*. This new material like Fendler's was secured at Colonia Tovar and at essentially the same altitude, so that it may have come from the same thicket. A strip of the bark accompanying Fendler's specimens shows that the trunk must attain a diameter of at least 1 dm. and probably much more. A chip of the wood shows it to be whitish, dense, and firm.

The specific name alludes to the resemblance of the leaves (in contour rather than texture) to those of the cultivated oleander,—a form of foliage not very frequent in the genus *Eupatorium*.

E. (§ **Conoclinium**) **militare**, spec. nov., herbaceum erectum ca. 1 m. vel ultra altum virgatum; caule tereti pallide brunnescente recto vel superne flexuoso usque ad 5 mm. crasso medulloso ad inflorescentiam simplici juventate brevissime puberulo tardius glabrato; internodiis ad 8 cm. longis; foliis oppositis erectis oblongo-lanceolatis a basi late sagittata usque ad apicem vix acutum gradatim angustatis denticulatis 7–12 cm. longis 1.6–3.7 cm. basi latis obscure (praecipue in costa) puberulis penniveniis utrinque viridibus subconcoloribus subchartaceo-membranaceis; petiolo usque ad 2 cm. longo puberulo supra conspicuiter canaliculato; inflorescentia corymbosa alterniramea planiuscula 1–2 dm. lata bracteata multicapitulata; bracteis lineari-lanceolatis vel (supremis) subfiliformibus; capitulis ca. 8 mm. diametro et 6 mm. altis 50–60-floris; involucri squamis numerosis ca. 3-seriatim imbricatis lanceolatis acutis modice inaequalibus dorso hirsutulis obscure 1–3-costulatis; receptaculo conico ubique anguste paleifero; paleis linearibus flosculos subaequantibus apice puberulis acutis; corollis albis glabris ca. 3.5 mm. longis; tubo proprio gracili 1.2 mm. longo; faucibus cylindricis distincte ampliatis 3.2 mm. longis; dentibus limbi deltoideis ca. 0.4 mm. longis; antheris apice cum appendiculo ovato obtuso munitis; achaeniis obovoideo-prismaticis vix 1 mm. longis griseo-brunneis ad angulis minute scabratis;

pappi setis ca. 32 albis tenuissimis sublevibus basi ex annulo cupuliforme orientibus.—ARGENTINA: Prov. Formosa. *Pedro Jörgensen*, no. 3229 (Gr.). **Flowers white, fragrant.**

This well marked species by habit and the nature of involucre and receptacle immediately suggests close affinity to *Eupatorium* § *Conoclinium*. The presence of pales on the disk, it is true, is a feature anomalous in the genus. Were this trait accompanied, as in the case of the Mexican *Eupatoriastrum* Greenman or the Bolivian *Sphaerupatorium* Ktze., by other technical differences or even by strongly divergent habit, the present plant might be separated as a monotypic genus, but the approach to *Eupatorium* § *Conoclinium* is here so close that such a segregation would have to rest solely upon the character of the paleaceous disk—a feature which is known to be inconstant in the neighboring genus *Ageratum* and elsewhere in the *Compositae*. At least until other species are discovered sharing with this the paleaceous disk and approaching it in habit to the extent of indicating a natural group, the plant seems best classed as an exceptional member of *Eupatorium* § *Conoclinium*. Of course, it approaches in its technical characters *Eupatoriastrum* but that is of quite different habit and geographically so remote as to render close affinity unlikely.

E. organense, Gardn., var. *junius* Bak. ex Glaziou, Bull. Soc. Bot. Fr. lvi. mém. 3, p. 391 (1909). As cited by Glaziou, l. c., this variety, which seems never to have been formally characterized, was based upon Glaziou's numbers 11,017 and 15,153. A specimen of the former number, kindly lent to the writer from the herbarium of the Botanical Museum of Copenhagen, proves to be E. GLAZIOVII Bak., though slightly less hirsute than the type. It certainly has nothing whatever to do with *E. organense* Gardn.

E. robustum Glaziou, Bull. Soc. Bot. Fr. lvi. mém. 3, p. 384 (1909), published as an "n. sp.?" but without characterization beyond the note that it is frutescent and has yellow and very fragrant flowers. The Kew sheet of Glaziou's no. 21,612, the number upon which Glaziou founded his *E. robustum*, was kindly loaned to the writer some time ago for study. The heads are very immature, in fact only in bud, and even very careful dissection has failed to bring out the florets clearly enough to show the nature of their pappus or to determine whether or not the disc is chaffy. To the writer it appears exceedingly improbable that this is a *Eupatorium*. To judge from its foliage, and habit he would take it to be a CALEA—a supposition to some extent confirmed by Glaziou's field note that the florets were yellow.

E. (§ **Praxelis** ?) **sagittiferum**, spec. nov., herbaceum ut videtur perenne (basi ignota) ca. 3 dm. altum gracile suberectum fere a basi ramosum; caule subtereti purpureo-brunneo vix 2 mm. diametro glabrescente; ramis gracilibus erectis leviter curvatis crispe puberulis fere per totam longitudinem foliosis; internodiis plerisque 4–6 mm. longis; foliis minimis oppositis et superne alternis erectis sessilibus deltoideo-ovatis vel supremis lanceolatis subacutis basi sagittatis vel subhastatis integris vel paullo in margine revoluta undulatis supra glabris lucidulis subtus vix pallidioribus glandulari-punctatis utrinque reticulatis 5–12 mm. longis 1.8 4.5 mm. latis; capitulis terminalibus solitariis vel in corymbis 3-cephalis dispositis 12 mm. altis 6 mm. diametro erectis; pedunculis 1.5–3.4 cm. longis 1–3-bracteolatis; involucri ovoideo-campanulati squamis numerosis plus quam 40 pluri-seriatim imbricatis adpressis 3-nervatis brunnescentibus, extimis et intermediis apice subacuminato-cuspidatis et utrinque cum angulo lobulove laterali instructis ad apicem verum vix acutis dorso glandulifero-atomiferis, intimis anguste oblongis vel linearibus apicem versus puberulis et ciliolatis; receptaculo conico; corollis ut videtur purpureis ca. 5.6 mm. longis sursum gradatim ampliatis tubo proprio indistincte differentiato ca. 1.4 mm. longo; faucibus ca. 3.2 mm. longis glabris; dentibus limbi ca. 1 mm. longis acutiusculis margine paullo incrassitis dorso granulatis; styli ramis filiformibus vix clavellatis minute papillosis laete lilaceo-purpureis; achaeniis gracilibus 3.5 mm. longis deorsum decrescentibus in angulis hirtellis in faciebus glabris; pappi setis ca. 32 sordide albis scabratis ca. 5 mm. longis.—Brazil: Minas Geraës, *Dr. A. Glaziou*, no. 19,537 (K., Copenhagen, phot. and slight fragm. Gr.).

This plant does not happen to have been cited by Dr. Glaziou in the published lists of his Brazilian collections (Bull. Soc. Bot. Fr. lvi. and lvii.). It was determined by Mr. J. G. Baker as "Eupatorium (Osmia) sp." and was found under this designation both in the Kew Herbarium and Copenhagen Botanical Museum. It is surprising that a species so marked should not have received description or at least have been given an herbarium name, especially as the supposed novelties in Glaziou's collection were generally given provisional names though not described.

As to the relationship of this plant its affinity seems to be quite as much with § *Praxelis* as with § *Cylindrocephalum* to which (as *Osmia*) it was referred by Baker. It has a conical receptacle characteristic of the former group and the peculiar shape of its involucral scales is not so very unlike that of *E. decumbens* (Gardn.) Bak.—

referred by Baker to § *Praxelis*—a species which also has small leaves, terminal sub-solitary heads, and purple styles, as well as the same type of achenes.

E. SUBPENNINERVIUM Sch.-Bip. ex Klatt, Leopoldina, xx. 89 (1884). This little known and not very fully described Mexican species has not been rediscovered or at least again reported in print. It was collected by Liebmann at "Vaqueria Jacal, 10,000'." This doubtless refers to the locality known as Vacqueria del Jacal on Mt. Orizaba which in fact is at an altitude of about 10,000'. (See Lasègue, Mus. Bot. Deless. 469.) In the herbarium of the late Dr. F. W. Klatt, now in the Gray Herbarium, there is a single sheet representing this species. It bears a fairly detailed pen-drawing of stem, inflorescence, and two detached leaves, also a pocket containing some fragments of an involucre and florets. With some undetermined material of the *Eupatorium* tribe lent to the writer from the Botanical Museum at Berlin, is now found a sheet of material so closely corresponding in habit and most details with Klatt's sketch and fragments that it seems best to refer it provisionally to the same species. It is Ehrenberg's 1095. The label states that it was collected "In monte Kankandó en la Encarnacion Jan. 40." This means doubtless the Cordillera Cangando in the State of Hidalgo. So far as can be judged from factors of climate, altitude, distance, etc., there is no reason why Schultz's *E. subpenninervium* should not be rediscovered at this point. It is of somewhat similar altitude and not more than 300 kilometers distant in a more or less continuously mountainous region. While the corollas are described as "alba marginata" by Klatt, they are roseate or purplish in the Ehrenberg material in which some of the heads are still immature. This difference is very likely one of observation or record, but in any event does not seem to be very significant since white-flowered forms of purple-flowered species are of such frequent occurrence.

E. VISCOSUM HBK. Nov. Gen. et Spec. iv. 129 (1820). As already suggested by the writer (Proc. Am. Acad. liv. 361), it seems probable that the type of *E. viscosum* did not come from Ecuador as doubtfully indicated by Kunth's expression "crescit in Regno Quitensi?" but in reality was gathered in the neighborhood of Bogotá. At all events, as more material of the Colombian *E. latipes* Benth. has been available for examination, it has become evident that the trifling differences of leaf-dimensions, fineness of serration, shortness and breadth of the petiole, etc., supposed to separate the Colombian species from the earlier *E. viscosum*, all break down. It seems clear,

therefore, that *E. latipes* Benth. should be reduced to the synonymy of *E. viscosum* HBK. The species is certainly frequent around Bogotá, where Humboldt & Bonpland collected extensively, but a century of subsequent exploration has failed to demonstrate its occurrence in Ecuador to which it was originally assigned with doubt. The case is closely similar to that of *E. elegans* and *E. rorulentum* discussed above.

Kanimia microphylla, spec. nov., perenne herbacea vel paullo lignescens virgata 3–4 dm. alta erecta a basi aliquando decumbente; caule brunneo puberulo vel tomentello folioso; internodiis plerisque 1–3 cm. longis; ramis numerosis erectis gracillimis 2–5 cm. vel ultra longis foliosissimis; foliis caulinis oppositis triangulari-ovatis obtusis basi subtruncatis 13–15 mm. longis 10–12 mm. latis integris vel saepissime utroque dente unico basilari instructis et qua de causa subhastatis supra sparse puberulis subtus multo pallidioribus puncticulatis obscure squamuliferis et in nervis 3 pubentibus; petiolo ca. 3 mm. longo; foliis rameis oppositis multo minoribus plerisque ad anthesin 5 mm. longis et 4 mm. latis ovatis et integris vel triangulari-hastatis et in quoque latere unidentatis subsessilibus; inflorescentia oppositiramea terminali vel parva corymbosa subsimplici 4 cm. alta et crassa vel thyrsiformi majus composita 15 cm. longa et 8 crassa; pedicellis ca. 3 mm. longis; capitulis 4-floris ca. 1 cm. altis 5 mm. crassis cum bracteola ovato-oblonga demidium breviore suffultis; involucri squamis oblongis subobtusis 9 mm. longis 2 mm. latis firmiusculis dorso convexis griseo-puberulis; corollis post exsiccationem rubescenti-brunneis ca. 5 mm. longis; tubo proprio 2 mm. longo atomifero; faucibus paullo ampliatis 2 mm. longis; limbi dentibus 5 ovatis acuminatis dorso resinoso-atomiferis; achaeniis 2.8 mm. longis, 1.2 mm. crassis atrobrunneis griseo-puberulis ca. 10-costatis; costis pallidis; pappi setis plus quam 110 inaequalibus vix scabratis.—*K. gracilis* Glaziou, Bull. Soc. Bot. Fr. lvii. mém. 3, p. 396 (1910), not Bak.—Brazil: Minas Geräes: Moro do Inficionado, near Caraça, May–June, *Glaziou*, no. 15,120 (K., Brl., phot. and fragm. Gr.).

A clear photograph and some fragments of *K. gracilis* Bak., kindly supplied to the writer by Sir David Prain, Director of the Royal Gardens, Kew, show that that species has the cauline leaves considerably larger, more ovate, less deltoid and more acute, with the brownish veins forming an evident reticulation on the lower surface; furthermore, the corymbs are smaller and denser, the heads apparently subsessile.

DYSCRITOTHAMNUS FILIFOLIUS Robinson, gen. et spec. nov.

[Reprinted from RHODORA, Vol. XXIV. July, 1922.]

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NEW SERIES NO. LXVI.

POLYPODIUM VIRGINIANUM AND P. VULGARE.

By M. L. FERNALD.

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GARDEN

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POLYPODIUM VIRGINIANUM AND P. VULGARE

M. L. Fernald.

In eastern America we are so used to designating our common Polypody of rocky woods as *Polypodium vulgare* L. and the hosts of fern-specialists who have studied our ferns during the last three-fourths of a century have so universally followed this usage, that to many people it may seem as if our fern has a vested right to the name. When, however, we look into the original treatment of Linnaeus in the *Species Plantarum*,[1] it is at once clear that he restricted the name *P. vulgare* exclusively to the plant of Europe ("*Habitat in* Europa *rimis rupium*"); while to the plant of eastern America ("*Habitat in* Virginia") he assigned the name *P. virginianum*. Linnaeus also included under *P. virginianum* a citation of one of Plumier's West Indian plates and a reference to Petiver which do not belong with the Virginian plant, but the source of his name was clearly the *Polypodium virginiense minus, foliis obtusioribus* of Morison's Plant Hist. Univ. Oxon. iii. 563, sect. 14, t. 2, fig. 3 (1715), published with a good illustration and very fair description of the common Polypody of eastern America. Morison's conventionalized figure showed the rootstock unusually clean of scales (although occasional herbarium-specimens of the American plant have almost

[1] L. Sp. Pl. ii. 1085 (1753).

completely lost them) and from this fact Linnaeus was misled into over-emphasizing this rather unusual and post-mortem character, describing his *P. virginianum*: "Polypodium frondibus pinnatifidis: pinnis oblongis subserratis obtusis, radice laevi" and adding the comparative note: "*Antecedenti* [*P. vulgare*] *simillima, sed minor, & subtus glabra.*" This over-emphasis on the smooth rootstock was again displayed by Amos Eaton when, in 1818,[1] he stated that *P. vulgare*, "var. *virginianum*, has a naked root," though Jacob Bigelow[2] had given a better description of the American plant and referred to the fronds as "divided . . . by sinuses which are more acute than in the European variety."

The first post-Linnean botanist to make a really satisfactory differentiation of our plant from the European *Polypodium vulgare* was Sir William Hooker who, in 1840, considered typical *P. vulgare* almost strictly European, while in America there were two varieties: "β. *Americanum*; minus, fronde angustiore, laciniis remotioribus. P. Virginianum, *Linn. Sp. Pl.* p. 1345 (*excl. Syn. Plum. &c.*) . . . γ. *occidentale;* frondis laciniis acutis acute serratis. P. vulgare, Virginianum. *Bong. Veg. Sitcha,* p. 57."[3] Var. *americanum* was given a range through southern Canada west to the Saskatchewan and Slave River, while var. *occidentale* occurred from the mouth of the Columbia north to Sitka; and Hooker added under var. *americanum* the following illuminating comment: "The common state of this plant throughout the United States and in British N. America, is to be smaller than the European form, with narrower and more oblong fronds, with laciniae more distant, and the sori nearer the margin This is no doubt the *P. Virginianum* of Linnaeus and authors, as far as regards the Virginia plant, on which Linnaeus founded his character." Somewhat later, in that storehouse of accurate observation, his *Flora of the State of New York*, Torrey took up var. *americanum* and in his description added the highly important character: "Segments mostly alternate, 3–4 lines wide."[4] Still later, in 1848, Kunze, who certainly had an intimate knowledge of European ferns, published a suggestive comment: "*P. vulgare*, β. *americanum*. Hook., (*P. virginianum*, L.,) differs from the European form by a

[1] Eaton, Man. ed. 2: 373 (1818).
[2] Bigelow, Fl. Bost. 252 (1814).
[3] Hook. Fl. Bor.-Am. ii. 258 (1840).
[4] Torr. Fl. N. Y. ii. 484 (1843).

narrower and more elongated frond, narrower lobes separated by wider sinus, the lowest being longer or at least not shorter than the following ones, and the sori being always nearer the margin than in the European plant. I have not met with any American specimens entirely agreeing with the true *P. vulgare* of the old world."[1]

These quotations are sufficient to indicate that the most discerning of the earlier students of our ferns were convinced that no true *Polypodium vulgare* occurs in eastern America, although there was difference of judgment as to whether our plant was specifically or only varietally separable from it. Since the statements above quoted little has been consciously added to the once rapidly accumulating series of differential characters and for three-fourths of a century our plant has passed, with only desultory and inconclusive challenges, as typical *P. vulgare*. For instance, the late B. D. Gilbert stated that, "For some time past I have been inclined to look upon our so-called *Polypodium vulgare* in Eastern North America as a distinct species from the European and Pacific coast species . . . However, I am not yet prepared to separate the two, which can only be done by one who has a large number of European as well as American specimens;"[2] while the English specialist, the late C. T. Druery, in 1902, assumed the identity of *P. virginianum* with European *P. vulgare* when he urged "The undesirability of attaching different names on your [American] side to varietal types which may already exist on this [European]."[3] In 1907, it is true, Tidestrom took up our plant as *P. virginianum*, but with only one highly inconstant character: "In its outward appearance this species differs in no appreciable degree from *P. vulgare*. The latter species is characterized by having from 3 to 5 *stelai* at the base of the petiole, while in our plant the number is commonly 2, and in older leaves 3,—2 being normal and 1 is smaller."[4] In such a discriminating work as Christensen's *Index Filicum*, however, *P. virginianum* appears as an unquestioned synonym of *P. vulgare*, although full specific rank is accorded *P. californicum* Kaulf., *P. falcatum* Kell. (*P. vulgare*, var. *occidentale* Hook., *P. Glycyrrhiza* D. C. Eaton, *P. occidentale* (Hook.) Maxon) and *P. hesperium* Maxon, plants so strongly resembling variants

[1] Kunze, Am. Journ. Sci. ser. 2, vi. 82 (1848).
[2] Gilbert, Fern Bull. x. 14 (1902).
[3] Druery, Fern Bull. x. 51 (1902).
[4] Tidestrom, Elysium Marianum, ed. 2: 18 (1907)

of the European *P. vulgare* that only upon the most minute but often inconstant characters can they possibly be kept apart from them.

In fact if one compares a series of typical Californian plants (for example *Heller's* no. 5011 or 7255, *C. F. Baker's* no. 235; *Abrams's* no. 3021 or *Parish's* no. 4375) with a series of the European *P. vulgare*, var. *serratum*, he will have the greatest difficulty in separating the fronds; or similarly, he will be puzzled if he compares them with such European plates as Lowe's *Our Native Ferns*, i. t. 6 (and figs. 6, 18, 21, etc.) or Moore's *Nature Printed British Ferns* (octavo ed.), i. tt. 1 and 2. Hooker & Baker in *Synopsis Filicum*, to be sure, placed *P. californicum* in the Section *Goniophlebium* with "Veins forming ample regular areolae," while *P. vulgare* was kept in *Eupolypodium* with "Veins free"; but they certainly must have been in error for, although some extreme specimens show several areolae, the veins of *P. californicum* are mostly quite free and specimen after specimen shows no difference in venation between this species and the European. Indeed, several European specimens in the Gray Herbarium, especially of *P. vulgare*, var. *serratum*, have quite as many areolae as there are in extreme Californian plants; and such "nature-printed" illustrations of the European *P. vulgare* as those of Moore's *Nature Printed British Ferns* (octavo ed.) tt. 3 D and 5 or Ettinghausen & Pokorny's *Gefässpflanzen Oesterreichs in Naturselbstdruck*, i. (t. 7) show as numerous areolae as many Californian specimens, especially those referred to *P. californicum*, var. *intermedium* D. C. Eaton, of which its author frankly stated, that "in var. *intermedium* this species [*P. californicum*] makes an inconveniently near approach to *P. vulgare*," adding the comment: "It may be noticed in this connection that Milde says of the veinlets of *P. vulgare*, var. *serratum*, '*Interdum ramos anastomosantes inveni.*' "[1]

Similarly, the same difficulty is experienced in separating fronds of *Polypodium falcatum* (for instance, *J. C. Nelson*, no. 1122) from such a plate as Lowe's no. 9, representing *P. vulgare*, var. *Acutum-Stansfieldii*. In this connection it is noteworthy that, in *Synopsis Filicum*, Hooker & Baker assigned *P. vulgare* a North American range only from "Sitka, southward to California and the north of Mexico," *i. e.* they *excluded*, by inference, *P. virginianum* of the East and *included* as specifically inseparable from *P. vulgare* the western

[1] D. C. Eaton, Ferns of N. A. i. 246 (1879).

P. falcatum and *P. californicum*, var. *intermedium;* at the same time calling "*P. falcatum*, Kellogg (*P. glycyrrhiza*, Eaton), a Californian variety, with the pinnae finely toothed, and narrowed very gradually to an acute point."[1] Very similarly, Diels states the range to include in America, at least by inference, only the western region: "südlich bis Makaronesien, Nordafrika, Vorderasien, Japan, Nordmexico."[2]

From earliest times the European *Polypodium vulgare* has attracted the gatherers of medicinal herbs on account of its sweet roots. Gerarde in the 16th century, stated that the root "hath in it a certaine sweetenes";[3] Parkinson, in the 17th, said it has "a certaine sweetish harshnesse in the taste,"[4] Morison, in the 18th, described it with a "sweet taste (sapore dulci)";[5] and Diels, in the 19th, said, "Das Rhizom ('Radix polypodii S. filiculae dulcis'—'Engelsüss') enthält Zucker."[6] In view of the many indications of specific identity between the Polypodies of western America and the European *P. vulgare* it is not surprising, therefore, to find in Kellogg's original account of *P. falcatum* the statement that the rootstock has a "sweetish liquorice flavor";[7] that D. C. Eaton, publishing the same species almost simultaneously gave it the name *P. Glycyrrhiza*, with "Rootlets aerial, having a sweet flavor like that of liquorice";[8] that by Piper & Beattie it is called *Licorice-root Fern* because "The rootstocks taste much like licorice, and are eaten by children";[9] and that Maxon, in describing as a species of the western mountains *P. hesperium*, stated that, "It is doubtful whether *hesperium* is very closely related to the eastern *vulgare*. Its affinities seem rather to lie with the Polypodiums of the Pacific coast, one especially notable feature which it possesses in common with them being the hard licorice-like rootstock. The rhizomes of the eastern *vulgare*, on the other hand, are not only spongy and quite acrid but more or less unsavory in taste."[10]

The only character which I have thus far been able to discover, by which *Polypodium californicum, P. falcatum* and *P. hesperium*

[1] Hook. & Baker, Syn, Fil. 334 (1868).
[2] Diels in Engler & Prantl, Pflanzenf. i. Ab. 4: 311 (1899).
[3] Gerarde, Herball, 972 (1597).
[4] Parkinson, Theatrum Botanicum, 1040 (1640).
[5] Morison, Pl. Hist. iii. 562 (1715).
[6] Diels, l. c. (1899).
[7] Kellogg, Proc. Cal. Acad. i. 20 (1854).
[8] D. C. Eaton, Am. Journ. Sci. ser. 2, xxii. 138 (1856).
[9] Piper & Beattie, Fl. N. W. Coast, 3 (1915).
[10] Maxon, Proc. Biol. Soc. Wash. xiii. 200 (1900).

can be separated from most European *P. vulgare*, is in the scales of the rhizome. In most of the European plants the scales are very prolonged into a capillary tip; in the plants of Pacific America they are less prolonged. But such plants as those distributed by Dörfler in his *Herbarium Normale* as no. 3687, *P. vulgare*, forma *variegata* from Germany, have the scales quite like those of the western American plants; and certainly there is nothing to separate this German material specifically from such representatives of *P. californicum* as *Abrams & McGregor's* no. 31 from Ventura Co., California, *Kellogg & Harford's* no. 1164 from Lone Mountain, California, *Heller's* no. 13,090 from Butte Co. or his no. 5030 from Sonoma Co., *Parish's* no. 4373 from San Bernardino Co., or *Abrams's* no. 3100 from San Diego Co. Similarly Dörfler's no. 3687 is quite as indistinguishable from such representatives of *P. falcatum* as Bongard's Sitkan material sent out as *P. vulgare, virginianum*, *Funston's* no. 13 from Yakutat Bay, *Eastwood's* no. 798 from Shagway or *G. R. Vasey's* no. 42 from Washington, the latter all originally and correctly distributed as *P. vulgare* but specifically inseparable from plants passing as *P. falcatum*.

In European *Polypodium vulgare* and the western American *P. californicum*, *P. falcatum* and *P. hesperium* the scales of the rhizome, though varying in different plants from pale-cinnamon to dark brown, are individually of tolerably uniform color throughout and (under high magnification) show a similarly close cellular structure with thin cell-walls; in the eastern American *P. virginianum*, on the other hand, the scales commonly have a deeper-colored median band and they are of much looser or more open structure, and the cell-walls are thickish. The late D. C. Eaton, leaning too confidently upon European authors, described the rootstock of the eastern American plant as "covered with ovate-acuminate brownish chaffy scales, peltately attached near the base;"[1] but as Miss Slosson points out in her description of the eastern plant: "I find a sinus leading from the base to the point of attachment. An over-lapping of the sides of this sinus often makes the scales appear peltately attached."[2] Miss Slosson thus accurately describes the basal scales of *P. virginianum*, while Eaton's description accords with that of European

[1] D. C. Eaton, Ferns N. A. i. 239 (1879).
[2] Slosson, How Ferns Grow, 49 (1906).

authors when describing their plant, for example Luerssen who definitely calls the scales "schildförmig."[1] Careful comparison of scales from the two plants shows this to be a constant character and, as would be expected, the scales of the western American *P. californicum*, *P. falcatum* and *P. hesperium* agree with the European *P. vulgare* in being peltately attached just above their base.

Reference has been made to Tidestrom's statement that *P. virginianum* differs from *P. vulgare* in having only 2 or 3 vascular bundles at the base of the stipe, two of them large, the third smaller; while in *P. vulgare* there are said to be 3 to 5 bundles. Luerssen[2] somewhat similarly describes *P. vulgare* as having at the base of the stipe 2 large and 2 smaller bundles, while Waters[3] definitely places our plant in his section with "Bundles three at extreme base." Whether there is any pronounced difference in the number and arrangement of the bundles cannot be determined without more adequate European material; but it is significant that some dried European plants, in which the stipe has been severed just above the base, seem to show only 2 bundles while others show but 3.

The habitats of *Polypodium vulgare* and of *P. virginianum* are usually very different. Although some forms occur on rocks or on mossy banks or even sand dunes,[4] a common habitat in Europe is tree-trunks (either living or dead), old stumps and fallen logs. The early European herbalists, for instance Gerarde in the 16th century, distinguished "*Polypodium Quercinum* Polipodie of the Oke," which occurs "in the tops of the trunks of trees in thicke woods";[5] Kerner von Marilaun in his popular compilation, the *Natural History of Plants* (*Pflanzenleben*), says: "*Polypodium vulgare* is often met with enveloping the trunks and boughs of large trees";[6] Luerssen briefly states its habitat in continental Europe: "Auf Baumwurzeln und Baumstumpfen, moosbewachsenen Felsblocken, an alten Mauern und in Felsspalten";[7] while Lowe gives the following vivid picture from Great Britian: "Looking higher up the tree, an epiphyte in the shape of a Fern has taken possession, and is clothing the forks from

[1] Luerssen, Farnpfl. 54 (1889).
[2] Luerssen, Farnpfl. 55 (1889).
[3] Waters, Ferns, 73 (1903).
[4] Warming, Oecology of Plants, ed. Groom & Balfour, 267 (1909).
[5] Gerarde, Herball, 974 (1597).
[6] Kerner von Marilaun, Nat. Hist. Pl. ed. Oliver, ii 705 (1895).
[7] Luerssen, Farnpfl. 55 (1889).

where the branches spring; and this Fern is the Common Polypody. It is a Fern that delights to run along the ground amongst old wood and moss . . . It may justly be called a parasite—or rather an epiphytal plant—which seeks to hasten to destruction those trees where decay has made its appearance . . . A group of pollard willows clothed with *Polypodium vulgare* are [is] both singular and interesting."[1] Similarly, the Pacific American varieties of *P. vulgare* delight in mossy carpets, old stumps and tree-trunks. Thus Watson, in the *Botany of California* speaks of *P. vulgare* as "often growing on trees" and *P. falcatum* "On trees and sometimes on rocks";[2] Macoun & Burgess speak of *P. falcatum* as "frequent in the hollows of living trees";[3] Piper & Beattie assign *P. occidentale* to "moss on rocks, logs and trees"; [4] while Henry says of *P. vulgare*: "Often on mossy trees and logs".[5]

How different from the ordinary habitat of *Polypodium virginianum*, which is accurately described in many books on the eastern American ferns. Thus Waters says that *P. virginianum* "prefers the top of a shaded ledge of rocks";[6] Miss Slosson likewise says: "Flat or slightly sloping surfaces of rocks, woodland banks, stone walls, etc."; [7] while Clute equals Lowe in his vivid account: "Wherever there is a shaded ledge of rocks in the northeastern States one is almost sure to find the polypody . . . There is no question as to choice of location with this sturdy species. All are alike to it, provided there are rocks upon which it can grow. The only preference it has is for the tops and upper shelves of the rocks where the soil is moderately dry. So characteristic is it in such situations that when one sees a fern clad rocky summit from a distance too great to discern the individual fronds he identifies them with confidence as this species."[8] In fact so generally is *P. virginianum* of eastern America a plant of rock-habitats or woodland banks that, when it is rarely found as an epiphyte it at once attracts attention. Thus when the late Lester F. Ward, in 1878, discovered it as an epiphyte on *Betula nigra*, he was so interested

[1] Lowe, Our Native Ferns, i. 24, 25 (1867).
[2] Watson, Bot. Cal. ii. 334 (1880).
[3] Macoun & Burgess, Trans, Roy. Soc. Can. ii. Sect. iv. 181 (1884).
[4] Piper & Beattie, Fl. N. W. Coast, 3 (1915).
[5] J. K. Henry, Fl. So. Brit. Columb. 3 (1915).
[6] Waters, Ferns, 79 (1903).
[7] Slosson, How Ferns Grow, 51 (1906).
[8] Clute, Our Ferns in their Haunts, 196 (1901).

in the novel habitat that he specially recorded the discovery, the Polypody growing on the "trunk several feet above the base, after the manner of *P. incanum* . . . The roots have taken a firm hold in the clean living bark, so that I collected my specimens with a knife, leaving the bark attached."[1] In 1884, in their paper on *Canadian Filicineae*, after stating the range and the ordinary habitat of the plant in Canada, Macoun & Burgess added as a noteworthy item: "growing plentifully on old elm trees, near Belleville, Ont., near Heely Falls, Trent River, Northumberland Co., Ont., and near Amherstburg, Essex Co., Ont."[2] In 1903 Waters[3] published a photograph, taken apparently near Baltimore, of "The Polypody at the Base of a Tree". In September, 1906, Professor J. Franklin Collins showed me at Lincoln, Rhode Island, several trees of *Betula lenta* with festoons of Polypody hanging from the lower halves of the trunks, and he was so interested in the novelty that he photographed the colony; and similar occurrences in Nova Scotia, observed in 1920, seemed so unusual as to merit the note: "*Polypodium vulgare* [i. e. *P. virginianum*], here having no rocks to grow on, was climbing the tree-trunks, the creeping rootstocks ascending in the crevices of the bark to a height of 2 or 3 meters" and at another station "the tree-climbing *Polypodium* again."[4] Almost simultaneously, Professor Duncan S. Johnson discussed in some detail the occurrence of the eastern American Polypody on trees near Baltimore, this habitat being so unusual in his experience that he had "not been able to find a definite report of its being really epiphytic in habit in the United States."[5] In Europe and Pacific America, then, although often occurring on mossy rocks and wooded banks, *P. vulgare* is frequent on living or dead trees; but the eastern American *P. virginianum*, though very rarely epiphytic, is ordinarily a plant of rock-habitats.

In view of the similarly stout and firm, sweetish rhizome with peltately attached scales of similarly dense structure, the identical fronds with often very broad pinnae (up to 1.8 cm. and rarely to 4 cm.) bearing median sori, the clearly intergrading venation, and the

[1] L. F. Ward, Field and Forest, iii. 150 (1878) and report in Bull. Torr. Bot Cl. vi. 238 (1878).
[2] Macoun & Burgess, Trans. Roy. Soc. Can. ii. Sect. iv. 181 (1884).
[3] Waters, Ferns, 82 (1903).
[4] Fernald, Rhodora, xxiii. 147, 149 (1921).
[5] D. S. Johnson, Bot. Gaz. lxxii. 237 (1921).

predilection for living or dead trees, stumps and mossy logs, the plants of western America are certainly specifically inseparable from the endlessly variable *P. vulgare* of Europe. Their ranges on the two continents are so strikingly similar to those of *Blechnum Spicant* (L.) Sm. (western Eurasia, north Africa and the Atlantic Islands; southern Alaska to California) and *Equisetum maximum* Lam. (*E. Telmateia* Ehrh.) (western Eurasia, north Africa and the Atlantic Islands; British Columbia to southern California) that absolutely no violence is done the probabilities of truth by treating them as one species; and, until they are shown to have stronger characters than their supporters have yet pointed out, it would seem only the part of sound classification so to treat them. Diels has expressed almost this conclusion by saying, "*P. californicum* Kaulf. (pacifisches Nordamerika) kommt dem *P. vulgare* L. so nahe, dass es nur durch die (noch dazu nicht überall constante) Maschenbildung davon zu trennen ist";[1] Schur, describing the European *P. vulgare*, var. *transsilvanicum* made the note: "An P. vulgare, var. occidentale *Hook*";[2] Eaton, describing *P. californicum*, var. *intermedium*, practically admitted that he could not separate it from the European *P. vulgare*, var. *serratum*; Hooker & Baker gave up the attempt to keep *P. falcatum* distinct from European forms of *P. vulgare*; and Maxon, in publishing *P. hesperium* as a species, suggested the possibility "that the species here described is identical with the var. *rotundatum* [of *P. vulgare*] of Milde."

Neither *Blechnum Spicant* nor *Equisetum maximum* extend eastward far beyond the limits of Europe. It is, therefore, significant to note Hooker's statement[3] of the Eurasian range of *Polypodium vulgare*: "Europe, to its extreme south; North Africa, Madeira, Canaries, and Azores . . . ; Siberia, the Amur, Manchuria, Japan (unknown in the tropical continent of Asia, or even in the Himalaya). From Erzeroum, Asiatic Turkey, I possess specimens." In other words, except from an indefinite "Siberia," the species was not known to Hooker from between Europe and adjacent Asia Minor and "the Amur, Manchuria, Japan." Ledebour, in *Flora Rossica*,[4] cites Siberian material only from the Ural (on the Russian

[1] Diels in Engler & Prantl, Pflanzenf. i. Ab. 4: 312 (1899).
[2] Schur, En. Pl. Transsilv. 830 (1866).
[3] Hook. Sp. Fil. iv. 205 (1862).
[4] Ledeb. Fl. Ross. iv. 508 (1853).

border), then from the Altai eastward across the Baikal region to Kamchatka. I have seen no Altai nor Japanese material and it is probable that all the Japanese plant is referable to *P. Fauriei* Christ, Bull. Herb. Boiss. iv. 672 (1896). (*P. vulgare*, var. *japonicum* Franchet & Savatier, Enum. Pl. Jap. ii. 244 (1879); *P. japonicum* (Franch. & Sav.) Maxon, Fern Bull. x. 42 (1902), not Hoult. (1783)). The plant of Amur and Manchuria, however, well shown in the Gray Herbarium, is neither European *P. vulgare* nor the Japanese *P. Fauriei* but is a good match in all characters for the eastern American *P. virginianum*.

This specific identity of the Polypody of Amur and Manchuria with the plant of eastern America, while the western American species prove to be inseparable from the European, is so exactly what we have learned to expect, that in itself it is some indication that we are dealing with two distinct species; and the various characters already discussed lead inevitably to the conclusion that *P. vulgare* and *P. virginianum* are separated by many fundamental differences.

Another point worthy of brief note is the comparative variability of the two. In Europe *Polypodium vulgare* is so exceedingly given to the production of varieties and sports that it, along with the European and western American *Blechnum Spicant* and *Athyrium Filix-femina*,[1] supplies a large proportion of the 1119 varieties of ferns recognized in the British Isles alone in Lowe's *British Ferns, and where Found*. The fact that, to quote Druery, "This species has been very liberal in 'sports',"[2] supplemented by the infectious charm of the couplet,

> "How wonderfully you vary,
> *Polypodium vulgare.*"

has stimulated the fern lovers of eastern America to emulate their British cousins in searching for these so-called varieties. The result is well stated by Waters in the words: "The common polypody [of eastern America, i. e. *P. virginianum*] is not ordinarily a variable fern."[3] How different from Druery's statement just quoted or that of Mr. James Britten, in writing of the European plant: "The Poly-

[1] "in the eastern United States and Canada there are two distinct species of lady ferns, neither of which is conspecific with *A. Filix-femina* (L.) Roth of Europe . . . the ferns of the northwest are conspecific with the European plant, but, in some cases, differ from the common European forms of *A. Filix-femina* in certain minor points"—Butters, Rhodora, xix. 178, 179 (1917).

[2] Druery, Brit. Ferns, 172 (1910).

[3] Waters, Ferns, 81 (1903).

pody is a very variable species."[1] Discussion of the larger bearings of this difference, which the writer is considering in another paper, would lead us now too far afield; but the conclusion which immediately concerns us is, that the profound difference in the variability of the Polypodies of the two sides of the Atlantic, as well as on the two slopes of the North American continent, is due to the fact that they are two distinct species of quite different geological and geographic history and distribution.

The diagnostic characters of the two species and their American variations are shown below.

Rhizome firm, sweet, in American forms commonly 0.5–1 cm. thick; its pale-cinnamon to castaneous scales uniformly colored (or darker toward the base), densely cellular, with thin cell-walls, peltately attached slightly above the base, 0.5–1 cm. long; stipes (except in the smallest extremes) 1–3 mm. in diameter, 0.2–3 dm. long: fronds 0.2–5.5 dm. long, 0.1 2.4 (av. 1.1.) dm. broad: pinnae opposite, subopposite or alternate, the lowest commonly shorter than the middle ones; the latter 0.2–2 (in var. *cambricum* –4.5) cm. broad, their midribs commonly curving at base: sori commonly median . . . . . 1. *P. vulgare.*

Rhizome rather soft and spongy, not sweet, 2–7 mm. thick; its scales darkened on the back, loosely cellular, with thick cell-walls, cordate at base, often with a closed sinus, 2–4.5 mm. long; stipes 0.6–1.7 mm. in diameter, 0.1–2 dm. long: fronds 0.25–2.6 dm. long, 1.5–7 (av. 4) or in very unusual forms –11 cm. broad: pinnae alternate, or the lowest subopposite, usually about as long as or slightly longer than the median; the latter 2–8 (in very unusual forms –11) mm. broad, their midribs and those of the upper pinnae straight: sori nearly marginal . . . . 2. *P. virginianum.*

1. Polypodium vulgare L. Sp. Pl. ii. 1085 (1753). *P. californicum* Kaulf. Enum. 102 (1824). *P. vulgare*, var. Bong. Vég. Sitch. 175 (1832). *Marginaria californica* (Kaulf.) Presl, Tent. Pterid. 188 (1836). *P. vulgare*, γ *occidentale* Hook. Fl. Bor.-Am. ii. 258 (1840). *P. intermedium* Hook. & Arn. Bot. Beech. Voy. 405 (1841). *P. falcatum* Kellogg, Proc. Cal. Acad. i. 20 (1854). *P. Glycyrrhiza* D. C. Eaton, Am. Journ. Sci., ser. 2, xxii. 138 (1856). *Goniophlebium californicum* (Kaulf.) Moore, Ind. Fil. 386 (1862). *P. californicum*, vars. *Kaulfussii* and *intermedium* (Hook. & Arn.) D. C. Eaton, Ferns N. A. i. 244 (1879). *P. hesperium* Maxon, Proc. Biol. Soc. Wash. xiii. 200 (1900). *P. occidentale* (Hook.) Maxon, Fern Bull. xii. 102 (1904).—Europe and adjacent Asia and north Africa; Atlantic Islands; Alaska to Lower California, Arizona and New Mexico.

In North America the following varieties are recognizable, though

[1] Britten, Europ. Ferns, 165 (1881).

several herbarium-sheets show them variously mixed under one number and intergradient individuals are numerous.

Var. COMMUNE Milde, Fil. Eu. Atl. 18 (1867). *P. vulgare* (typical).—Frond lanceolate, of firm texture, 0.7–2.5 dm. long, 3–9 cm. broad; with subacute to obtuse oblong crenate or minutely serrulate pinnae, the longer 1.5–4.5 cm. long, 0.4–1 cm. broad.—Northern and central Europe; Alaska to Oregon. The following are characteristic. ALASKA: rocks, Nagai Island, Shumagin Islands, July 27, 1872, *M. W. Harrington;* near the Mission, Yakutat Bay, June 6, 1892, *Funston*, no. 13; Sitka, *Bongard*, *Bischoff*; trail to the lakes, Skagway, July 20, 1914, *Eastwood*, no. 798. WASHINGTON: moss on trees, Quiniault Valley, June 20, 1902, *H. S. Conard*, no. 107; Castle Rock, Cowlitz Co., October 31, 1902, *Piper*. OREGON: Hood River, Wasco Co., May 26, 1910, *Heller*, no. 10,095; Elk Rock, Multnomah Co., November 24, 1902, *E. P. Sheldon*, no. 11,342; Calapooya Valley, Douglas Co., July 26, 1899, *M. A. Barber*, no. 122.

The extreme of the var. *commune* with the pinnae strongly rounded at tip is sometimes distinguished as forma *rotundatum* Milde, Gefäss-Crypt. Schlesien, 631 (1858). Var. *rotundatum* Milde, Fil. Eu. Atl. 18 (1867). In publishing var. *rotundatum* Milde made it perfectly clear that the plant of Alaska with round-tipped pinnae was in his mind, giving the range: "Non raro in Europa bor.—Unalaschka. Kadjak. Sitcha."

Var. COLUMBIANUM Gilbert, Working List N. A. Pterid. 19,38 (1901). —Frond firm, narrowly oblong, 0.5–2 dm. long, 2–4.2 cm. broad: the 7–18 pairs of mostly alternate round-tipped obscurely to deeply crenate pinnae oblong-elliptical to narrowly obovate, the median and lower usually of about uniform length; the longer 1–2 cm. long, 0.5–1.2 cm. broad.—Var *rotundatum* E. G. Britton, Fern Bull. vii. 35 (1899), not Milde. *P. hesperium* Maxon, Proc. Biol. Soc. Wash. xiii. 200 (1900). Var. *hesperium* (Maxon) Nelson & Macbride, Bot. Gaz. lxi. 30 (1916).—In the mountains, British Columbia to Montana and the Black Hills of South Dakota, south to Colorado, Utah and Oregon. The following are characteristic. BRITISH COLUMBIA: Fraser River, *Wallace*; within five miles of Lillooet, July, 1916, *J. M. Macoun*, nos. 93,250, 93,251. MONTANA: Big Fork, July 24, 1908, *Mrs. J. Clemens*. WYOMING: dry granite cliffs, Crow Creek, Albany Co., July 8, 1903, *A. Nelson*, no. 8902. COLORADO: Hardscrabble Canyon, Custer Co., August, 1898, *H. M. M.* UTAH: Cottonwood Canyon, August, 1869, *Watson*, no. 1357. OREGON: basaltic cliffs, Bingham Springs, Umatilla River, July 17, 1908, *Cusick*, no. 3287. WASHINGTON: Wenatchie region, July, 1883, *Brandegee*, no. 1208; Stehekin, Lake Chelan, July 5, 1901, *Whited*, no. 1392; rocks, Cape Horn,

August 18, 1894, *Suksdorf*, no. 2336; crevices of rock, Mt. Baldy, July 7, 1902, *Conard*, no. 288.

When he published var. *columbianum*, Gilbert at least knew of *P. hesperium* for he included it in his *List*, but all the points emphasized by him: "the short stipes and narrow fronds, the very glandular surfaces, the odd pinna at base of frond, the deep lobations of lower pinnae, and the occasionally green-gold hue of lower surface," are found in one specimen or another of *P. hesperium*. The measurement of the fronds nearly coincide with those originally given for *P. hesperium* ("6 to 13 cm. long, 2 to 3½ cm. broad."—Gilbert; 3 to 8 inches [7.3 to 19.6 cm.] long, 1 to 1¾ inches [2.4 to 7.2 cm.] broad—Maxon); the glandularity of the frond is extremely variable, though Maxon originally indicated some glandularity for *P. hesperium*; and the alternate pinnae (and consequently "odd pinna at base of frond") were specially emphasized by Maxon and they were described with "margins obscurely (or less often, decidedly) crenate."

When he published *P. hesperium* as a species, Maxon said, "It is barely possible, but hardly probable, that the species here described is identical with the var. *rotundatum* of Milde." Surely the larger development of the plants (such as G. R. Vasey's no. 41 or Whited's no. 1392 from Lake Chelan, the type region of *P. hesperium*) are difficult to distinguish from var. (or forma) *rotundatum* and Mr. J. K. Henry (Fl. So. Brit. Columb. 2) reduces them outright; but the pinnae are too broad and short to satisfy Luerssen's requirement (Farnpfl. 56) of pinnae "linealisch oder länglisch-linealisch;" and although the larger plants closely approach Alaskan and Norwegian specimens of forma *rotundatum*, var. *columbianum* may stand as a fairly differentiated extreme of the western mountains. In its narrower forms passing insensibly to

Var. PERPUSILLUM Clute, Fern Bull. xviii. 98 (1910).—Fronds coriaceous, linear-oblong, 0.3–1.7 dm. long, 1–2 cm. broad; their 6–22 pairs of remote alternate pinnae 2–5 mm. wide.—Mountains of Colorado, New Mexico and Arizona. COLORADO: *Brandegee*. NEW MEXICO: lower side of cliff, vicinity of Brazos Canyon, Rio Arriba Co., August 20, 1914, *Standley & Bollman*, no. 10,626.

Var. PYGMAEUM Schur, Enum. Pl. Transsilv. 830 (1866).—Stipe 1–7 cm. long, slender: frond ovate-lanceolate, ovate or deltoid, 2–8 cm. long, 2–3 cm. broad, with only 1–7 pairs of broad-oblong to narrowly ovate round-tipped pinnae or segments.—Forma *pumilum* Hausm. ex Luerss. Farnpfl. 58 (1889).—The following American

specimens, all from ARIZONA, seem quite like European material: Maple Canyon Falls, Huachuca Mts., 1882, *Lemmon*; dry shaded crevices, north side of cliffs, Miller Canyon, Huachuca Mts., 1909, *Goodding*, no. 123 (distributed as *P. hesperium*); without statement of locality, 1903, *J. H. Ferriss*; moist rocks at 8000 ft., Rincon Mts., 1909, *Blumer*, no. 3439.

Var. OCCIDENTALE Hook. Fl. Bor.-Am. ii. 258 (1840).—Fronds elongate, broad-lanceolate, usually of thin texture, 1–5.5 dm. long, 0.6–2 dm. broad, with 10–36 pairs of narrowly lanceolate, attenuate or acute finely serrate or serrate-dentate pinnae.—*P. falcatum* Kellogg, Proc. Cal. Acad. i. 20 (1854). *P. Glycyrrhiza* D. C. Eaton, Am. Journ. Sci. ser. 2, xxii. 138 (1856). Var. *falcatum* (Kellogg) Christ, Beitr. Krypt. Schweiz. i. Heft. 2: 51 (1900). *P. occidentale* (Hook.) Maxon, Fern Bull. xii. 102 (1904).—Southern Alaska to northern California. ALASKA: dry rocky beach, Tongas Village, August 3, 1915, *Walker*, no. 888 in part (mixed with var. *commune*). BRITISH COLUMBIA: Skidegate, Queen Charlotte Islands, June 13, 1910, *Spreadborough*, no. 94,847; New Westminister, 1899, *A. J. Hill*; Brackendale, June 15, 1916, *J. M. Macoun*, no. 93,246; Goldstream, Vancouver I., May 18, 1887, *J. Macoun*; on tree-trunks, mostly alder, District of Renfrew, 1901, *Rosendahl & Brand*, no. 98. WASHINGTON: mossy rocks and logs, August 20, 1888, *F. Binns*; Friday Harbor, San Juan Islands, 1917, *Zeller*, no. 794; old rotten logs in mossy woods, Tacoma, November 13, 1898, *Flett*. OREGON: Sauvies Island, *J. Howell*; on tree-trunks, Coos Bay, *Lemmon*; moss-covered trees, Coos River, October 29, 1881, *Pringle*; rocky woods, Salem, May 9, 1917, *J. C. Nelson*. CALIFORNIA: Charlotta, Humboldt Co., June, 1915, *E. P. Hawver*; Feather River, Butte Co., March 29, 1919, *Heller*, no. 13,089.

The extreme plant (var. *falcatum*) with very long-attenuate pinnae seems to be practically if not quite the European var. *transsilvanicum* Schur, Enum. Pl. Transsilv. 830 (1866), which was described: "Elatum 12–15 poll. Fronde ambitu lanceolata, utrinque viridi; laciniis lineari-oblongis, 3 poll. long. 3–4 lin. latis, a media sensim acuminatis, acutis, manifeste serratis," with the discriminating comment by Schur: "An P. vulgare var. occidentale *Hook.*" It is also very close to the European var. *attenuatum* Milde, Fil. Eur. Atl. 18 (1867) and to var. *Acutum-Stansfieldii* Lowe, Our Native Ferns, i. 28, t. 9 (1867).

Var. **intermedium** (Hook. & Arn.), n. comb.—Fronds ovate to ovate-oblong, herbaceous to membranaceous, 1–3.5 dm. long, 0.6–1.2 dm. broad, with 6–23 pairs of oblong or oblong-linear coarsely serrate, crenate or subentire acute to obtuse pinnae 0.6–1.8 cm. broad.—*P. intermedium* Hook. & Arn. Bot. Beech. Voy. 405 (1841). *P. californi-*

cum, var. *intermedium* (Hook. & Arn.) D. C. Eaton, Ferns N. A. i. 244, t. 31, fig. 4. (1879).—Oregon to Lower California. Oregon: Multnomah Co., October, 1877, *Howell*. California: Feather River, Butte Co., March 29, 1919, *Heller*, no. 13,090; Little Chico, March 10, 1897, *Mrs. R. M. Austin*, no. 1868; hills near Santa Rosa, Sonoma Co., March 10, 1902, *Heller*, no. 5011; open banks of Sonoma Creek, May 23, 1902, *Heller*, no. 5030; large mats on boulders and ledges, King's Mountain, San Mateo Co., January 15, 1902, *Baker*, no. 235; Stockton Pass, May 4, 1879, *L. G. Yates*; Santa Cruz, 1873, *Anderson*; foothills west of Los Gatos, Santa Clara Co. March 5, 1904, *Heller*, no. 7255; San Luis Obispo Co., 1886, *M. M. Miles*; Sulphur Mountains, Ventura Co., June, 1908, *Abrams & McGregor*, no. 31; near San Bernardino, May, 1894, *Parish*, no. 2824. Lower California: Guadalupe Island, 1889, *Palmer*, no. 857.

The Pacific American representative of var. *serratum* Willd. of southern Europe, the Mediterranean region and the Atlantic Islands. Differing chiefly in the scales of the rhizome, which are usually shorter and less attenuate than in var. *serratum*. When he published *P. californicum* var. *intermedium*, Eaton commented on it as making "an inconveniently near approach to *P. vulgare*" and at the same time quoted Milde as remarking "of the veinlets of *P. vulgare*, var. *serratum*, '*Interdum ramos anastomosantes inveni*,' " the character chiefly relied upon to keep *P. californicum* separate from *P. vulgare*. Azorean specimens (for instance, Ponta Delgada, *Ware*) of var. *serratum* certainly show quite as many areolae as any Californian plants.

Var. intermedium, forma **projectum**, n. f., pinnis mediis imisque inequaliter abbreviatis subtruncatis, costis excurrentibus. California: Chico Canyon, Butte Co., December 29, 1902, *E. B. Copeland*, no. 2749 (type in Gray Herb.).

Var. **Kaulfussii** (D. C. Eaton), n. comb. Fronds ovate to ovate-oblong, coriaceous, 0.5–2.1 dm. long, 0.4–1.3 dm. broad, with 7–15 pairs of oblong to oblong-linear obtuse to acutish serrate, crenate or subentire pinnae 0.7–1.2 cm. broad: veinlets more often anastomosing than in most varieties.—*P. californicum* Kaulf. Enum. Fil. 102 (1824); *P. californicum*, var. *Kaulfussii* D. C. Eaton, Ferns N. A. i. 244 (1879).—California and Lower California. The following are characteristic. California: Berkeley, March 1, 1891, *Blankinship*; vicinity of San Bernardino, March 23, 1897, *Parish*, no. 4347; Los Angeles, July, 1879, *James*; Del Mar, April 4, 1914, *Clements*, no. 3; near mouth of San Gabriel Canyon, San Diego Co., March 13, 1903, *Abrams*, no. 3120. Lower California: Guadalupe Island, 1875, *Palmer*, no. 103, March–June, 1897, *Anthony*, no. 256.

Closely simulating the more coriaceous extreme of var. *serratum* of southern Europe; differing from it chiefly in the shorter and less attenuate scales of the rhizome.

Var. CAMBRICUM (L.) Willd. Sp. Pl. v. 173 (1810).—Frond ovate or ovate-oblong, 2–2.5 dm. long, 1–2 dm. broad; its pinnae or many of them up to 1 dm. long and 4 cm. broad, deeply and irregularly pinnatifid or lacerate.—*P. cambricum* L. Sp. Pl. ii. 1086 (1753). *P. australe* Fée, Gen. Fil. 236, t. 20A, fig. 2 (1850–52). Var. *hibernicum* Moore, Handb. Brit. Ferns, ed. 2: 44 (1853).—Western Europe; Portland Inlet, British Columbia, acc. to Burgess, Trans. Roy. Soc. Can. ii. Sect. iv. 10 (1886).

2. P. VIRGINIANUM L. Sp. Pl. ii. 1085 (1753) as to Virginian plant; Tidestrom, Elys. Marianum, ed. 2: 18 (1907). *P. vulgare*, var. *virginianum* (L.) Eaton, Man. ed. 2: 373 (1818). *P. vulgare*, β. *americanum* Hook. Fl. Bor.-Am. ii. 258 (1840); Torr. Fl. N. Y. ii. 484 (1843); Kunze, Am. Journ. Sci. ser. 2, vi. 82 (1848). *P. vulgare* of eastern Am. authors, not L.—Shaded rocks, woodland banks and rarely tree-trunks, Newfoundland to Manitoba and northeastern Alberta, south to the mountains of northern Georgia and Alabama, Illinois and eastern Missouri. The following are characteristic illustrations: Eaton, Ferns N. A. i. t. 31, fig. i (1879). Clute, Our Ferns in their Haunts, 196 and t. 6 (1901); Waters, Ferns, 78 and 80 (1903).

No true varieties of *P. virginianum* are known. The following minor forms are recognizable.

Forma **acuminatum** (Gilbert), n. comb. *P. vulgare acuminatum* Gilbert, Fern Bull. x. 13 (1902). *P. vulgare*, var. *angustum* of Am. authors, not Muell. *P. vulgare*, var. *attenuatum* Am. authors, not Milde.

Forma **elongatum**, (Jewell), n. comb. *P. vulgare*, forma *elongata* Jewell, Maine Woods, xxx. no. 31: 3 (1908).

Forma **brachypteron** (Ridlon), n. comb. *P. vulgare*, forma *rotundatum* Ridlon, Am. Fern Journ. xi. 48, t. 1 (1921), not Milde. *P. vulgare*, forma *brachypteron* Ridlon, Am. Fern Journ. xi. 122 (1922).

Forma **subsimplex**, n. f., laminis subsimplicibus lineari-lanceolatis 7–9 cm. longis 0.7–1 cm. latis crenatis basi undulatis.—NEW HAMPSHIRE: on top of a rock, Intervale, July, 1911, *Anna I. Rodliff* (TYPE in Gray Herb.).

Forma **deltoideum** (Gilbert), n. comb. *P. vulgare*, formae *deltoideum* and *hastatum* Gilbert, Fern Bull. xiv. 37 (1906). *P. vulgare*, var. *auritum* Buchheister, Am. Bot. v. 56, fig. 3 (1903), not Willd. nor Gilbert. *P. vulgare*, forms, Clute, Fern Bull. xviii. 48, figs. 1, 2 and 3 (1910).

Forma **bipinnatifidum**, n. f., pinnis plus minusve pinnatifidis.—

Type: Western Mountain, Mt. Desert Island, Maine, August, 1902, *Miss E. L. Shaw* in Gray Herb.

This form includes the plants referred in eastern America to *P. vulgare*, vars. *cambricum* (L.) Willd., *semilacerum* Moore and *sinuatum* Willd. It is well illustrated by Waters, Ferns, 83 (1903), and by Buchheister, Am. Bot. v. 55, fig. 1 and 57, fig. 4 (1903).

Forma **chondroides**, n. nom. *P. vulgare*, var. *bifido-multifidum* Gilbert, Fern Bull. xiv. 39 (1906), not Druery.

Forma **alato-multifidum** (Gilbert), n. comb. *P. vulgare*, var. *alato-multifidum* Gilbert, Fern Bull. xiv. 105 (1906).

Forma **Churchiae** (Gilbert), n. comb. *P. vulgare*, var. *Churchiae* Gilbert, Fern Bull. xiv. 39 (1906).

[Reprinted from RHODORA, Vol. 24, Nos. 284-286, August-October, 1922.]

CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY

New Series, No. LXVII

NOTES ON THE FLORA OF WESTERN NOVA SCOTIA, 1921.

M. L. FERNALD.

DATES OF ISSUE.

Pages 157-164,	11 September, 1922.
Pages 165-180,	27 September, 1922.
Pages 201-208,	6 October, 1922.

MISSOURI BOTANICAL
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[Reprinted from Rhodora, Vol. 24, Nos. 284-286, August-October, 1922.]

CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY

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CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY, NEW SERIES, NO. LXVII.

NOTES ON THE FLORA OF WESTERN NOVA SCOTIA 1921.

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The results[1] of our exploration of Nova Scotia in 1920 were so gratifying that it seemed wise to continue the work, with Yarmouth as a center, during another season. Accordingly, Mr. Bayard Long and I devoted two months in 1921 to further investigation of the flora of western Nova Scotia. We were accompanied for all too short periods in July by Messrs. Edwin B. Bartram and Norman C. Fassett, and for a few days in September we had the active cooperation of Professor Horace G. Perry of Acadia University. The summer of 1920 had been abnormally wet, with the result that savannahs and lake-margins were often inaccessible or the characteristic plants of these habitats drowned or very tardy in development. In marked contrast, the summer of 1921 was phenomenally dry, in northwestern Nova Scotia to the point of extreme drouth; and the shores of undammed lakes were generally exposed, while small ponds had in some instances completely evaporated. We were consequently able to explore many places which were inaccessible in 1920, with the result that the ranges of a large proportion of the coastal plain types were extended and a good number of additions to our previous list of Nova Scotian plants discovered. Several regions, for example southwestern Lunenburg County, in the neighborhood of Bridgewater furnished days of thrilling botanizing and important discoveries, but they were all in general character so similar to our already described experiences of 1920, that they need not be related in detail. The itinerary of the summer, briefly stated, was as follows, the collecting being done by Mr. Long and myself unless otherwise stated.

July 13: Markland (Cape Forchu), Yarmouth Co., *Fernald, Bartram, Long & Fassett.*
July 14: Atwood Brook, Shelburne Co., *Bartram & Long.*
Upper Wood's Harbor, Shelburne Co., *Fernald & Fassett.*
July 16: Brazil Lake, Yarmouth Co., *Bartram & Long.*
Lake George, Yarmouth Co., *Fernald & Fassett.*
July 18: Annapolis Royal and Granville, Annapolis Co., *Fernald, Bartram, Long & Fassett.*

[1] Rhodora, xxiii. 89-111 (1921), 130-152 (1921), 153-171 (1921), 184-195 (1921), 223-245 (1922), 257-278 (1922), 284-300 (1922).

July 19: Granville Center, Belle Isle, Lamb's Lake and Grand Lake, Annapolis Co., *Fernald, Bartram, Long & Fassett.*
July 21: Tusket and Gavelton, Yarmouth Co., *Fernald, Bartram, Long & Fassett.*
July 23: East Branch of the Tusket as far east as St. John (Wilson) Lake, Yarmouth Co., *Fernald, Bartram & Long.*
July 25: Windsor, Hants Co., *Fernald, Bartram & Long.*
July 26: Uniacke Lake and Five-Island Lake, Hants Co., *Fernald, Bartram & Long.*
July 27: Truro, Colchester Co. and Shubenacadie Grand Lake, Halifax Co., *Fernald, Bartram & Long.*
July 28: Darmouth and Armdale (Dutch Village), Halifax Co. *Fernald, Bartram & Long.*
August 2: Welshtown (Birchtown) Lake, Shelburne Co.
August 3: Roseway River, Shelburne Co., north to Jones Lake.
August 4: Shelburne to Sable River, Shelburne Co.
August 5: Harper Lake, Shelburne Co.
August 8: Weymouth, Digby Co.
August 9: Headwaters of Meteghan and Tusket Rivers, from Little Metehgan Lake to Wentworth Lake, Digby Co.
August 10: Drainage of Sissiboo River, from Everitt Lake to Mistake Lake, Digby Co.
August 12: West Branch of Tusket River, frcm Carleton to Parr Lake, Yarmouth Co.
August 13: Gavelton (Butler's) and Vaughan (Tusket) Lakes, Yarmouth Co.
August 15: Bridgewater, Lunenburg Co.
August 16: Bridgewater, Hebb's Lake, Fancy L., Wallace L., etc., Lunenburg Co.
August 17: Lahave River, north to Wentzell Lake; Mushamush River; Rhodes Corner; Blystner Lake; all in Lunenburg Co.
August 18: Wile's (Oakhill) Lake, Feindel's L., and Rhodeniser L., Lunenburg Co.
August 21: Yarmouth, Yarmouth Co.
August 22: Markland (Cape Forchu), Yarmouth Bar and Overton, Yarmouth Co.
August 23: East Branch of Tusket from Quinan to Canoe Lake, Yarmouth Co.
August 25: Salmon (Greenville) Lake to Arcadia, Yarmouth Co.
August 27: Shobel's Mt., Sandy Cove, Digby Co.
August 28: Sandy Cove to Freeport, Digby Co.
August 29: Lakes of Lequille and Liverpool Rivers, from Lamb Lake to Boot and Liverpool Head Lakes, Annapolis Co.
August 30: Annapolis Royal, Annapolis Co.
September 2: Sloane, Fanning, Skinner, Pearl and Crawley Lakes, Yarmouth Co., with *H. G. Perry.*
September 4: Parr Lake, Yarmouth Co., and Cedar Lake, New Tusket, Digby Co., with *H. G. Perry.*
September 5: Argyle Head to Belleville, Yarmouth Co., with *H. G. Perry.*
September 7: Clyde River, from Port Clyde to Upper Clyde River, Shelburne Co.
September 8: Harper, Western and Gold Lakes, Shelburne Co.
September 9: Jordan River, from Jordan Falls to Lake John, Shelburne Co.
September 10: Five-River (Morris) Lake and Bower's (Beaver Dam) Lake, Shelburne Co

The more important range-extensions and observations of the summer are enumerated below; as in the previous enumeration the species new to Canada (37) are marked **, the additional ones (25) new to Nova Scotia.*

WOODWARDIA VIRGINICA (L.) Moore. Besides occurring as already reported, in Yarmouth and Queens Cos., the Chain Fern is characteristic of boggy shores and thickets northeastward through Digby Co. to Annapolis Co. (near Lamb's Lake; near Liverpool Head L.) It is frequent throughout Shelburne Co., sometimes, as at Harper Lake, reaching a height of 1.7 m.

W. AREOLATA (L.) Moore. Rather frequent in the Tusket Valley, north to Pearl Lake, Kemptville and east to St. John (Wilson) Lake; splendidly developed in the sandy alluvium and lake-margins of the Roseway River system, Shelburne Co., plants from near the head of McKay's Lake, Middle Ohio, measuring 7 dm. high.

ATHYRIUM ACROSTICHOIDES (Sw.) Diels. Rich woods on north Mt., Belle Isle, Annapolis Co.

A. ANGUSTUM (Willd.) Presl, var. ELATIUS (Link) Butters. Swampy woods on slopes above Lahave River, Bridgewater, Lunenburg Co.

THELYPTERIS SIMULATA (Dav.) Nieuwl. Reported from Yarmouth to Queens; but now known eastward to LUNENBURG Co.: knolls in boggy thicket by Wile's (Oakhill) Lake. Extending north in Yarmouth nad Shelburne Cos. to Kemptville and to Jones Lake, Roseway River.

THELYPTERIS BOOTTII (Tuckerm.) Nieuwl. At various stations in Shelburne and Lunenburg Cos.

CYSTOPTERIS FRAGILIS (L.) Bernh., var. MACKAYI Lawson. Local on the basaltic North Mt.: collected near Granville, Annapolis Co., and on Shobel's Mt., Sandy Cove, Digby Co.

WOODSIA ILVENSIS (L.) R. Br. Basaltic cliffs and ledges, Shofel's Mt., Sandy Cove, Digby Co.

SCHIZAEA PUSILLA Pursh. Additional stations indicate, with those already recorded, that the Curly Grass is to be expected in proper habitats in all acid areas in the province. Unrecorded stations are, for DIGBY Co.: forming a close turf with *Vaccinium Oxycoccus* and *Rynchospora alba* at peaty border (many acres) of Tibert Lake, Freeport,—this, probably the most extensive station known for the species, within a few rods of the Bay of Fundy; wet sphagnous hollows in peaty savannah along The Brook, Central Grove. SHELBURNE Co.: depressions and knolls in sphagnous bog near Birchtown Brook; moist depressions in sandy *Corema*-heath and in wet sphagnous bog, Hope's Lot Barrens, Clyde River; wet mossy hollows in savannah east of Jordan Falls.

LYCOPODIUM INUNDATUM L., var. BIGELOVII Tuckerm. Reported as common in Yarmouth and Digby Cos. Abundant in Shelburne Co. and more locally in Lunenburg and Halifax Cos.

*Selaginella rupestris (L.) Spring. Basalt ledges, summit of Shobel's Mt., Sandy Cove, Digby Co.

*Isoetes macrospora Dur. Gravelly bottom of Clyde River, Middle Clyde.

I. echinospora Dur., var. Braunii (Dur.) Engelm. Gravelly and muddy bottoms of brooks, West Branch of Tusket River, Havelock and New Tusket, Digby Co.

Pinus Strobus L. The wind-swept and starved trees on the rocky barrens near Armdale, Halifax Co., have leaves only 2.5–5 cm. long and from a short distance away so strongly resemble *P. Banksiana* that such trees may have been the bases of unverified records of *P. Banksiana* from near Halifax.

Thuja occidentalis L. As suggested in Rhodora, xxiii. 188 (1921), Cedar Lake, east of Corberrie, Digby Co., proves to have a characteristic growth of *Thuja* at its border.

Potamogeton Oakesianus Robbins. Probably common throughout the silicious areas; additional collections from Lunenburg and Hants Cos.

P. pulcher Tuckerm. Digby Co.: quagmire-margin of Sears Lake, New Tusket (form with remarkably small and round emersed leaves). Lunenburg Co.: brook-beds in peaty swale by Rhodeniser Lake, east of Bridgewater.

P. amplifolius Tuckerm. Annapolis Co.: shallow water of Young's Lake, North Mt., Belle Isle. Digby Co.: peaty cove in Little Meteghan Lake.

P. confervoides Reichenb. Shelburne Co.: Swanburg Lake, Shelburne; Five-River (Morris) Lake.

In bog-pools near Argyle Head, Yarmouth Co., *P. confervoides* had developed, in early September, many winter-buds and tubers. The plants, which had fruited in July and early August, were nearly disintegrated, but their extensively creeping, filiform rootstocks bore short branches terminated by reddish fusiform tubers, while the old axils of the stems and the tips of the disintegrating branches bore fusiform dark-green winter-buds 0.7–2 cm. long, their leaves spreading-ascending.

P. dimorphus Raf. At several stations in Digby and Lunenburg Cos.

Scheuchzeria palustris L. Quagmires of Shelburne Co.

**Alisma plantago-aquatica L., var. parviflora (Pursh) Farwell, Ann. Rep. Comm. Parks & Boulev. Detroit, xi. 44 (1900). The small-flowered and -fruited southern extreme. Hants Co.: Windsor.

Panicum dichotomiflorum Michx. Shelburne Co.: dryish sandy beaches of Harper and Welshtown (Birchtown) Lakes.

P. VIRGATUM L., var. SPISSUM Linder, RHODORA, xxiv. 15 (1922). Besides the stations recorded in RHODORA, xxiii. 192 (1921), the following indicate a wide distribution in the province. YARMOUTH Co.: Goven and Gilfilling Lakes. SHELBURNE Co.: Bower's (Beaver Dam) Lake; McKay's and Jones Lakes, Roseway River. LUNENBURG Co.: Wentzell Lake.

P. DEPAUPERATUM Muhl., var. PSILOPHYLLUM Fernald, RHODORA, xxiii. 193 (1921) and forma CRYPTOSTACHYS Fernald, l. c. 194. Additional stations in Shelburne, Lunenburg and Halifax Cos.

P. SPRETUM Schultes. Additional stations are, for ANNAPOLIS Co.: Grand Lake and Liverpool Head Lake. DIGBY Co.: Journeay Lake, Weymouth. YARMOUTH Co.: Goven and Canoe Lakes. SHELBURNE Co.: Harper Lake. LUNENBURG Co.: Hebb's Lake, Bridgewater; mill-pond north of Blockhouse; Blystner and Rhodeniser Lakes.

**P. MERIDIONALE Ashe. YARMOUTH Co.: cobbly beach of Gavelton (Butler's) Lake, Gavelton; first station east of Massachusetts.

P. LINDHEIMERI Nash, var. SEPTENTRIONALE Fernald, RHODORA, xxiii. 227 (1922). LUNENBURG Co.: dry pine and oak woods on steep slopes along Lahave River, Bridgewater.

**P. CLANDESTINUM L. YARMOUTH Co.: rocky and gravelly thicket bordering Pearl Lake and dominant in thicket along Tusket (Kempt) River, Kemptville. LUNENBURG Co.: upper border of cobbly beach, Wentzell Lake. Heretofore unknown east of the Penobscot.

*ORYZOPSIS PUNGENS (Torr.) Hitchc. Characteristic of dry barrens of Shelburne and southwestern Lunenburg Cos.

CALAMAGROSTIS PICKERINGII Gray. Sandy and peaty barrens, eastward at least to Halifax Co.

C. PICKERINGII, var. DEBILIS (Kearney) Fernald & Wiegand. Similar habitats, more common.

SPHENOPHOLIS PALLENS (Spreng.) Scribn. Near Wentworth gypsum quarries, Windsor.

SPARTINA ALTERNIFLORA Loisel., var. PILOSA (Merr.) Fernald. Apparently frequent on salt marshes from Yarmouth Co. to Annapolis Co. and presumably beyond.

PHRAGMITES COMMUNIS Trin. ANNAPOLIS Co.: a large colony in the ditch and on the adjacent railroad bank bordering the salt marsh west of Annapolis Royal; most of the stolons subterranean, but some superficial and reaching a length of 7.6 m. (25 feet).

DISTICHLIS SPICATA (L.) Greene. Salt marshes, Yarmouth Co. to Annapolis Co.

*POA SALTUENSIS Fernald & Wiegand, var MICROLEPIS Fernald & Wiegand, RHODORA, xx. 124 (1918). ANNAPOLIS Co.: brookside in mossy woods near Yoong,s Lake, North Mt. Belle Isle.

GLYCERIA OBTUSA (Muhl.) Trin. Abundant eastward at least to Lunenburg Co.; extremely variable in stature, some colonies, in open

bogs, fruiting when only 1.5–2 dm. high (panicles 4–6 cm. long), others, as at the quaking margins of Harpers and Western Lakes in Shelburne Co., making dense stands 1.2–1.3 m. high (panicles 1.7–1.9 dm. long).

Glyceria laxa Scribn. Eastward to Hants and Halifax Cos.

**Festuca rubra L., var. multiflora (Hoffm.) Aschers. & Graebn. Roadsides, Dartmouth.

Agropyron caninum (L.) Beauv., forma glaucum Pease & Moore. Crest of barrier beach, East Jordan, Shelburne Co.

*A. caninum (L.) Beauv., var. tenerum (Vasey) Pease & Moore, forma ciliatum (Scribn. & Sm.) Pease & Moore, Rhodora, xii. 72 (1910). Thin open humus and basaltic talus, North Mt., Belle Isle (Annapolis); Shobel's Mt., Sandy Cove (Digby).

Elymus virginicus L., var. hirsutiglumis (Scribn.) Hitchc. Digby Co.: wooded basaltic talus, Shobel's Mt., Sandy Cove.

Cyperus dentatus Torr. Eastward at least to Lunenburg Co.; characteristic of sandy or gravelly shores.

Eleocharis Robbinsii Oakes. Widely distributed; new stations in Annapolis, Hants and Lunenburg Cos.

E. olivacea Torr. Additional stations are as follows. Yarmouth Co.: peaty quagmire-pools in sphagnous bog near railroad station, Argyle Head. Lunenburg Co.: peaty quagmire-margin of Wallace Lake, Italy Cross.

*E. nitida Fernald. Exsiccated roadside gutter, North Mt., Belle Isle, Annapolis Co.

The occurrence of this little plant on the basaltic North Mt. is interesting, since all its other stations (in Newfoundland, Quebec,and northern New Hampshire) are likewise on basic or more or less calcareous rock.

**E. tuberculosa (Michx.) R. & S. Wet sandy or peaty beach of Harper Lake, Shelburne Co.; the typical southern plant, heretofore unknown from east of Massachusetts.

Scirpus Olneyi Gray. An additional station in Yarmouth Co. is at the border of a salt marsh along Argyle River.

**S. campestris Britton, var. novae-angliae (Britton) Fernald. Border of salt marsh, Jordan Falls, Shelburne Co.; heretofore unknown east of southern Maine.

Rynchospora fusca (L.) Ait. Common eastward at least to Lunenburg and Hants Cos.

R. capitellata (Michx.) Vahl. Common or at least frequent. New stations in Digby, Annapolis and Shelburne Cos.

R. capitellata, var. discutiens (Clarke) Blake. Additional stations are, for Shelburne Co.: wet peaty margin of Harper Lake; upper border of cobbly beach of Bower's (Beaver Dam) Lake.

LUNENBURG Co.; upper border of gravelly beach, Feindel's L., west of Bridgewater.

CLADIUM MARISCOIDES (Muhl.) Torr., forma CONGESTUM Fernald, RHODORA, xxiii. 234 (1922). Sphagnous boggy swale bordering Fancy Lake, near Conquerall, Lunenburg Co.

CAREX STRAMINEA Willd. See RHODORA, xxiii. 235 (1922). Somewhat general, though often in only small quantity, on borders of savannahs along East Branch of Tusket R., Yarmouth Co.

C. BEBBII Olney. HANTS Co.: dryish swales near Wentworth gypsum quarries, Windsor.

*C. ADUSTA Boott. A single plant left growing among disturbed rocks by roadside. Armdale (Dutch Village), Halifax Co.; presumably more abundant somewhere in the neighborhood.

C. R SEA Schkuhr. Damp thickets and clearings, North Mt., Granville, Annapolis Co.

**_C. muricata_ L. Abundant in large stools, open pastured slopes near Wentworth gypsum quarries, Windsor.

**C. LENTICULARIS Michx., var. BLAKEI Dewey in Wood, Class Book, 755 (1861). Cobbly beach of Wentzell Lake, Lunenburg Co. Previously collected by _J. R. Churchill_ at Ingonish, Cape Breton.

C. SWANII (Fernald) Mackenzie. _C. virescens_, var. _Swanii_ Fernald. Occasional from Yarmouth Co. to Annapolis Co.

**_C. panicea_ L., var. _microcarpa_ Sonder in Koch, Syn. ed. 2: 879 (1844). Thin open humus by roadside on North Mt., Belle Isle, Annapolis Co.

C. glauca Murr. Reported by Macoun in 1888 from "dry clay banks on the railway cutting just outside of Windsor." Now a very abundant and variable species throughout the gypsiferous region about Windsor.

*C. ANCEPS Muhl. _C. laxiflora_, var. _patulifolia_ (Dewey) Carey. ANNAPOLIS Co.: damp clearings and open rocky woods, North Mt., Granville; first authentic record from east of southern Maine, Macoun's earlier record being based on _C. leptonervia_ Fernald.

C. CRYPT LEPIS Mackenzie. Somewhat local, Halifax and Lunenburg Cos.

C. SCABRATA Schwein. DIGBY Co.: rich thicket by brook, East Ferry.

C. OLIGOSPERMA Michx. Apparently general in the acid areas.

**_C. hirta_ L. Abundantly naturalized on a sandy railroad bank, Annapolis Royal.

Although here recorded apparently for the first time from Canada, _C. hirta_ was collected in 1912 in a pastured field at Charlottetown, Prince Edward Island, _Fernald & St. John_, no. 7106.

C. LUPULINA Muhl. YARMOUTH Co.: swale by Ogden Lake. LUNENBURG Co.: by brook flowing into Caribou Lake.

C. Michauxiana Boeckl. Shelburne Co.: boggy savannah along Tigney Brook, Sable River. Halifax Co.: sandy swale bordering Shubenacadie Grand Lake.

C. bullata Schkuhr, var. Greenei (Boeckl.) Fernald. Northeastward to Annapolis Co. and east to Lunenburg Co.

Xyris montana Ries. Frequent eastward to Lunenburg Co.; sometimes, as at Wallace Lake, Italy Cross, reaching the phenomenal height of 4.2 dm. with heads 6–7 mm. in diameter.

(To be continued.)

NOTES ON THE FLORA OF WESTERN NOVA SCOTIA
1921.

M. L. Fernald.

(*Continued from page 164.*)

**Juncus effusus L., var. conglomeratus (L.) Engelm. See Fernald & Wiegand, Rhodora, xii. 85 (1910). Locally abundant in peaty soil, Shelburne. The old record from Nova Scotia was based on young and unidentifiable material.

J. effusus, var. Pylaei (Laharpe) Fernald & Wiegand. Hants Co.: swales near Uniacke Lake.

J. subcaudatus (Engelm.) Coville & Blake, var. planisepalus Fernald, Rhodora, xxiii. 241 (1922). Many new stations east to Hants and Halifax Cos.

J. militaris Bigel. The commonest form of *J. militaris* has, as described by Bigelow, the "Culm . . . with a long sheath or two at base, and commonly another above the leaf. Leaf cylindrical, erect, . . . inserted below the middle of the culm, and exceeding it in height,"[1] and tradition, as recorded in the herbarium of the late T. O. Fuller, tells us that "Bigelow named this *militaris* because it reminded him of a soldier carrying his bayonet above his head." So general is this combination of characters, the very tall and erect leaf and above it the firm bladeless sheath, that they have been treated as diagnostic. Thus, in the *Pflanzenreich*, Buchenau distinguishes *J. militaris* from related species by "Folium frondosum unicum, ca. in medium caulem insertum, strictum, crassum, unitubulosum, pungens, usque 100 cm. longum,"[2] while the key-character used in the 7th edition of Gray's *Manual* is: "Upper cauline leaves

[1] Bigelow, Fl. Bost. ed. 2: 139 (1824).
[2] Buchenau in Engler, Pflanzenr. iv. pt. 36: 173 (1906).

bladeless (or essentially so), consisting of firm tawny or colored sheaths 2.5–5 cm. long," etc.[1]

On the border of Nowland Lake in Havelock, Digby County, Nova Scotia, occurs a plant with technical characters (perianths, seeds, etc.) of *Juncus militaris* but differing conspicuously from the typical form of the species in having two well developed cauline leaves, the upper with the sheath much less chartaceous than usual and terminated by a green blade two to four times its length; and in the large accumulation of material in the Gray Herbarium and the herbarium of the New England Botanical Club there are 2 similar specimens from Cape Cod and 1 from southern Connecticut. After finding the Nowland Lake plant with two frondose leaves, Mr. Long and I watched the species carefully, and, although discovering no more of the Nowland Lake form, found that there are occasional colonies with the ordinary submedian erect leaf but quite lacking the firm bladeless sheath above. Sometimes large colonies of this form are uniform, sometimes it occurs with typical *J. militaris*.

In the material at hand, 125 collections show the typical form of *J. militaris* with one long leaf-blade and above it a large colored bladeless or nearly bladeless sheath; 4 collections have two well developed leaves and 21 a single long leaf without the large bladeless sheath above. The latter form, occuring as it does often intermixed with the typical plant, is a minor variation but the other seems to be a well pronounced form and it will facilitate reference to both these extremes if they are designated

J. MILITARIS Bigel., forma **subnudus, n. f., folio frondoso 1, folio secundo hypsophyllino nullo.—Occasional through the range of the typical form. TYPE: peaty border of a small pond, Upper Cornwall, Lunenburg Co., Nova Scotia, August 17, 1921, *Fernald & Long*, no. 23,627 (Gray Herb.).

J. MILITARIS, forma **bifrons, n. f., foliis frondosis 2, folio hypsophyllino nullo.—Infrequent through the range of the species. NOVA SCOTIA: forming subcespitose clumps, sandy and gravelly beach of Nowland Lake, Havelock, August 9, 1921, *Fernald & Long*, no. 23,626 (TYPE in Gray Herb.), August 27 (*Pl. Exsicc. Gray.*). MASSACHUSETTS: shore of pond, Eastham, July 13, 1907, *F. S. Collins*, no. 297; Dennis Pond, Yarmouth, July 18, 1907, *E. W. Simott.* CONNECTICUT: West Pond, Guilford, August 15, 1912, *A. E. Blewitt*, no. 1270.

J. NODOSUS L. Swales near Wentworth gypsum quarries, Windsor.

J. ACUMINATUS Michx. New stations eastward to Annapolis and Lunenburg Cos.

[1] Robinson & Fernald in Gray, Man. ed. 7: 269 (1908).

J. MARGINATUS Rostk. New stations eastward to Annapolis and eastern Shelburne Cos.

LOPHIOLA AMERICANA (Pursh) Wood. *L. septentrionalis* Fernald, RHODORA, XXIII. 243 (1922). LUNENBURG Co.: sphagnous boggy swale bordering Fancy Lake, near Conquerall.

At this station the large, freely stoloniferous and subcespitose plants at the quaking margin of the lake are strikingly similar to the original *L. septentrionalis* from Digby Neck; but farther back, on drier knolls, the plants are small, with solitary stems, short pedicels and denser lanate tomentum, quite like the typical plant of New Jersey. Study of this material shows that the seed- and capsule-characters, which were exhibited by the Digby Neck material, break down, and that *L. septentrionalis* is not specifically separable from *L. americana* of the New Jersey pine barrens.

**SISYRINCHIUM INTERMEDIUM Bicknell. Various colonies seem to belong to *S. intermedium*. The plants are all sterile and there still remains doubt as to whether *S. intermedium* is a true species. Our collections are from YARMOUTH Co.: border of spruce swamp, Markland (Cape Forchu); dry fields and clearings near St. John (Wilson) Lake. ANNAPOLIS Co.: thin open humus on North Mt., Belle Isle.

S. ATLANTICUM Bicknell. Eastward to Annapolis and Lunenburg Cos.

HABENARIA FLAVA (L.) Spreng. Several new stations, all in the valley of the Tusket, Yarmouth Co., north to Parr Lake and east to Canoe Lake.

H. OBTUSATA (Pursh) Richardson. Very rare in the western Counties. ANNAPOLIS Co.: mossy woods, North Mt., Belle Isle. YARMOUTH Co.: mossy spruce woods, Greenville.

H. MACROPHYLLA Goldie. DIGBY Co.: old mixed woods near Cedar Lake, New Tusket.

SPIRANTHES CERNUA (L.) Richard, var. OCHROLEUCA (Rydb.) Ames. Characteristic of the dryest of siliceous barrens. Additional stations are, for YARMOUTH Co.: gravelly railroad-bank, Belleville. SHELBURNE Co.: abundant on dry sandy *Corema*-heath, Hope's Lot Barrens, Clyde River; common on dry sandy *Corema*-barrens north of Jordan Falls.

Salix viminalis L. Naturalized in roadside thicket, Hassett, Digby Co.

OSTRYA VIRGINIANA (Mill.) K. Koch. YARMOUTH Co.: wooded shore of Parr Lake; tree with remarkably coriaceous foliage.

THE VARIETIES OF BETULA LUTEA.—In 1904 Dr. Britton, by describing *Betula alleghaniensis*,[1] called attention to the fact that we have two fairly marked trends of the Yellow Birch which had hither-

[1] Britton, Bull. Torr. Bot. Cl. xxxi. 166 (1904).

to passed as *B. lutea* Michx. f. *B. alleghaniensis*, based primarily upon material from the upper slopes of Mt. Pisgah, western North Carolina, distributed by the Biltmore Herbarium as no. 1619, was given a broad range: "From Massachusetts to Quebec and northern Michigan, south to southern New York, Pennsylvania, and in the mountains to Georgia." Subsequently, in his *North American Trees* (1908), Britton made more definite his differentiation of the two Yellow Birches by stating the key-characters (p. 247):

Fruiting scales 4 to 5 mm. long; leaves mostly cordate
14. *B. alleghaniensis.*
Fruiting scales 8 to 10 mm. long . . . ; leaves rarely cordate
15. *B. lutea.*

On pp. 258 and 259 of the same work, where the two are more fully described and illustrated, *B. alleghaniensis* is shown with the leaves very definitely *not* cordate, with scales there described as "4 to 6 mm. long" and having "the wedge-shaped part below the lobes very short" and the fruits cuneate-obovate; while *B. lutea*, assigned a more northern range, has the scales with prolonged "stalk-like part below the lobes" and the fruits suborbicular. Though recognizing the two extremes indicated by Dr. Britton, various other students of our trees have subsequently been unable to keep them apart as species. Thus, in 1918 Ashe recognized the extreme with short scales as *B. lutea*, var. *alleghaniensis* (Britton) Ashe,[1] and more recently I have so designated[2] much of the comon Yellow Birch of Nova Scotia. Subsequently, in an attempt to label properly the material in the Gray Herbarium and the herbarium of the New England Botanical Club, I have carefully studied the specimens, with the result that it seems possible to recognize two strong trends in the scales. The leaves do not show the difference indicated in the key-characters above quoted and, as already noted, Dr. Britton's own illustration of *B. alleghaniensis* shows no approach to cordate leaves. Neither does the difference of fruit brought out in his illustrations regularly accompany the differences in the scales. But in general the scales which are only 5–8 mm. long (I have been unable to find any mature scales as short as 4 mm. and the material in the Gray Herbarium of Biltmore Herb. no. 1619, the type-number of *B. alleghaniensis*, has the scales 7–8 mm. long) and with short (mostly 1–2 mm.) base are of firm or subcoriaceous texture; while the scales of the other extreme,

[1] Ashe, Bull. Charleston Mus. xiv. 11 (1918).
[2] Fernald, Rhodora, xxiii. 257 (1922).

8–13 mm. long and with prolonged base, are subfoliaceous and sometimes even subsquarrose.

The latter is the tree taken by Dr. Britton to be *B. lutea*, but when Michaux's original description and plate are examined it at once becomes clear that the original *B. lutea* Michx. f.[1] was identical with *B. alleghaniensis*, i. e. the common Yellow Birch with short and subcoriaceous short-based scales which "abonde surtout dans les forêts de la Nouvelle-Ecosse, de la Nouvelle-Brunswick, du district du Maine, où elle est désignée sous le seul nom de *Yellow birch*, Bouleau jaune." This is indicated not alone by the very characteristic drawing of the fruiting ament and scale but by Michaux's definite statement (pp. 153, 154) that "les écailles . . . sont trifides, très-acuminées, et longues d'environs 3 lignes (7 millimètres)." That this extreme of the species is more common in the forests of Nova Scotia, New Brunswick and Maine than is the tree with longer and subfoliaceous scales is clear from the representation of the two in the herbaria (including that of the Arnold Arboretum) at hand. Of typical *B. lutea* (*B. alleghaniensis*) Nova Scotia shows a representation of 7 collections, New Brunswick 3, and Maine 21; while of the tree with long subfoliaceous scales Nova Scotia shows 3 collections, New Brunswick 1 and Maine 3.

Although it has been implied that the long-scaled extreme is of more northern range than the short-scaled typical *Betula lutea* (*B. alleghaniensis*) it is noteworthy that the collections at hand show the latter to be more generally collected in the cooler or more northern regions. The figures just listed are to the point; likewise the fact that our only collections from Quebec are of typical *B. lutea* as are 6 out of 8 from Vermont and 6 out of 9 from New Hampshire. Furthermore, the collections from the southern Alleghanies show the typical short-scaled *B. lutea* from an altitude of 3400 feet on the Blue Ridge of Virginia, from "Upper slopes of Mt. Pisgah," North Carolina (type of *B. alleghaniensis*) and from 6000 feet on the Great Smoky Mountains; while the southern material of the long-scaled extreme is from "along the East Fork of the Greenbrier River," West Virginia, "ex regione inferiori Montium Alleghany, Doe River Valley, Tennessee", from "near foot of Thunderhead Mt., E. Tenn," and common below 4000 feet in the mountains of Macon County, North Carolina. The collections from Indiana are, likewise, consistent with these ranges,

[1] F. André-Michaux, Hist. des Arbres Forest. de l'Am. Sept. ii. 152, t. 5 (1812).

2 numbers being the short-scaled tree, 7 the long-scaled. Fruiting specimens from Newfoundland and Labrador are wanting, but it is significant that nearly all material at hand from Connecticut (6 out of 7 collections), New York (9 out of 10) and Tennessee (2) are of the long-scaled extreme. Whatever factor may influence the distribution of the two it would seem that the typical short-scaled *B. lutea* cannot be regarded as generally of more southern range than the other.

To summarize, the two varieties of *Betula lutea* are:

Betula lutea Michx. f. Hist. des Arbres Forest. de l'Am. Sept. ii. 152, t. 5 (1812). *B. excelsa* Pursh, Fl. Am. Sept. ii. 621 (1814), not Ait. *B. lenta*, α *genuina* Regel, Nouv. Mém. Soc. Nat. Mosc. xiii. 126, in part (1860). *B. lenta*, β *lutea* Regel in DC. Prodr. xvi. pt. 2: 179 (1868). *B. alleghaniensis* Britton, Bull. Torr. Bot. Cl. xxxi. 166 (1904), North Am. Trees, 257, fig. 216 (1908). *B. lutea alleghaniensis* (Britton) Ashe, Bull. Charlest. Mus. xiv. 11 (1918).—Scales of the fruiting ament firm and subcoriaceous, 5–8 mm. long; the cuneate basal portion 1–2.5 mm. long.—Cape Breton Island and Gaspé Co., Quebec to Ontario, south to the mountains of North Carolina, West Virginia, Illinois and Iowa.[1]

Var. **macrolepis**, n. var., squamis subfoliaceis maturitate 8–13 mm. longis, parte pedali elongata 2.5–6 mm. longa. *B. lutea* Britton, No Am. Trees, 258, fig. 217 (1908).—New Brunswick to Wisconsin south to Tennessee, Indiana and Illinois. The following are characteristic. New Brunswick: swamps, Campbellton, July, 1877, *R. Chalmers*. Nova Scotia: Comeauville, August, 1900, *L. L. Dame;* mixed woods, Argyle, August 4, 1920, *Long & Linder*, no. 21,001; wooded roadside, Armdale (Dutch Village), July 28, 1921, *Fernald, Bartram & Long*, no. 23,766. Maine: rocky woods, Dover, August 5, 1895, *Fernald*, no. 383; woods, High Head, Mount Desert Island, June 15, 1889, *Rand*; South Poland, 1893, *Kate Furbish*. New Hampshire: Randolph, August 17, 1902, *Pease*, no. 440; Breezy Point, Warren, July 23, 1908, *E. F. Williams*; woods, Dublin, July 23, 1897, *B. L. Robinson*, no. 266 (type in Gray Herb.). Vermont: Windham, July 9, 1904, *W. H. Blanchard*, no. 11. Massachusetts: Beverly, *Asa Gray*; Needham, December 9, 1883, *T. O. Fuller*; border of *Chamaecyparis* swamp, Hanson, October 29, 1916, *Fernald*, no. 15,128; Granville, September 20, 1913, *F. C. Seymour*, no. 34; Kitchen Brook, Cheshire, July 27, 1916, *J. R. Churchill*. Rhode Island: Johnston, *S. T. Olney*; border of low woods, Tiverton, June 11, 1912, *S. N. F. Sanford*. Connecticut: woods about Keney Park, Hartford, September 8, 1907, *A. W. Driggs;* woods, Southington, August

[1] Without fruiting material it is impossible to determine the exact identity of the Yellow Birch of Newfoundland, Labrador, and some regions to the south of the limits here given.

27, 1894, *Bissell*, no. 538; Mount Carmel, 1857, *D. C. Eaton*. NEW YORK: sandy woodlands, Whitestown, Oneida Co., September 2, 1904, *Haberer*, no. 808; border of sphagnum bog, southeast of Oriskany, July 2, 1904, *Haberer*, no. 809; moist rocky bank, Lower Enfield Ravine, Ithaca, September 5, 1915, *A. J. Eames*, no. 3922. WEST VIRGINIA: along East Fork of Greenbrier River, Pocohontas Co., September 19, 1904, *A. H. Moore*, no. 2364. TENNESSEE: lower slopes of the mountains, Doe River Valley, September, 1884. *John Ball*; near foot of Thunderhead Mt., July 25, 1896, *Ruth*, no. 474. INDIANA: tamarack and huckleberry marsh 6 miles north of Plymouth, August 31, 1914, *C. C. Deam*, no. 15,105; low border of Graveyard Lake, Steuben Co., June 11, 1911, *Deam*, nos. 8648, 8651 8653; wet woods about 12 miles east of Michigan City, June 17, 1911, *Deam*, no. 8760. WISCONSIN: Kilbourn, 1861, *T. J. Hale*; swamp, Preble, Brown Co., August 26, 1892, *J. H. Schuette*. ILLINOIS: Dixon, *Geo. Vasey*.

**BETULA CAERULEA-GRANDIS Blanchard, Betula, i. no. 1 (May 7, 1904). *B. caerulea*, var. *grandis* Blanchard in Vermont Phoenix for May 13, 1904 and Betula, i. no. 2 (May 13, 1904). *B. caerulea*, var. *Blanchardi* Sargent, Man. Trees N. A. 202, fig. 168 A (1905).—A characteristic tree in portions of Nova Scotia; probably of wide distribution. HALIFAX CO.: wooded roadside, Armdale (Dutch Village). LUNENBURG CO.: roadside thickets and banks of Lahave River, Bridgewater.

B. caerulea-grandis is an abundant and characteristic tree in some parts of Prince Edward Island, especially in the forests of Queens County where, in the outskirts of Charlottetown and in the dry woods along Brackley Point Road, it forms very extensive groves with the stature and bark of *B. papyrifera* but at once recognized by the highly lustrous blue-green upper surfaces of the leaves. Upon examination these are found to be quite glabrous as are the young branchlets. The fruiting aments strongly resemble those of *B. papyrifera*. *B. caerulea-grandis*, besides occurring as a characteristic tree on Prince Edward Island and in Nova Scotia, is found thence to the Gaspé Peninsula and the region of Quebec, and south to eastern and central Maine, northern New Hampshire and the Green Mountains of Vermont. It is the tree of eastern America, incorrectly called by me[1] in earlier publications *B. pendula* Roth and *B. pendula* var. *japonica* Rehder. Besides Blanchard's Vermont material and the Nova Scotia collections above cited the following are characteristic.

QUEBEC: vicinity of Montmorenci Falls, July 7, 1905, *J. Macoun*, no. 68,774. PRINCE EDWARD ISLAND: dry woods, Brackley Point

[1] Fernald, Am. Journ. Sci. ser. 4, xiv. 184, 191 (1902); Robinson & Fernald in Gray. Man. ed. 7: 335 (1908).

Road, August, 1 1912, *Fernald, Long & St. John,* nos. 7299, 7300. Maine: in disintegrated volcanic rock, Haystack Mountain, Aroostook Co., July 11, 1902, *Williams, Collins & Fernald*; shore of Rowe Pond, Pleasant Ridge, Somerset Co., September 10, 1909, *J. F. Collins*; near summit of hill with coast-survey tower, Cutler, July 7, 1902, *Kennedy, Williams, Collins & Fernald*; Sprague's Neck, Cutler, August 11, 1902, *Kate Furbish.* New Hampshire: Endicott Farm, Shelburne, July 4, 1914, *W. Deane*; roadside, Randolph, August 28, 1914, *Pease*, no. 16,298; near Glen House, Pinkham Notch, July 28, 1921, *T. W. Edmonson*, no. 5321.

When he first published *Betula caerulea-grandis* (May 7, 1904) Blanchard also put forward *B. caerulea*, introducing the two with the phrase: "The writer has found and here names and describes two new species of white birch." This first number of Betula was received at the Gray Herbarium on May 10, 1904. Almost immediately (on May 13) Blanchard issued in the *Vermont Phoenix* a popular account of his discoveries and reprinted this account "without change of type" as Betula, i. no. 2. In this second account he says "The blue birch, as I have said, presents two well-marked forms . . . . As these birches are without names I propose to call the smaller one **Betula caerulea** and the larger one **Betula caerulea** variety **grandis.**" This paper was received at the Gray Herbarium May 24 but, that Blanchard himself did not believe the larger-fruited tree to be really a variety of *B. caerulea*, is indicated by his annotations on the two copies sent, and on additional copies sent at the same time of Betula, no. 1. On the two copies of no. 2, in which *B. caerulea*, var. *grandis* was published as a variety, Blanchard had written in red ink; "Wise editor helped spoil" and "Spoiled by wise editor," while on the copies of no. 1 sent at the same time he wrote against the phrase "two new species;" "I stand by this" and "By this I stand now." It is thus clear that, although on *second thought* Blanchard wavered, on *third thought* he regarded the two as species as he had originally done. The name *B. caerulea*, var. *Blanchardi* (1905), based upon the same material as *B. caerulea-grandis* (1904) and *B. caerulea*, var. *grandis* (1904), **must be treated as a synonym.**

**Betula caerulea Blanchard, Betula, i. no. 1 (May 7, 1904); Sargent, Man. Trees N. A. 201, fig. 168 (1905). Halifax Co.: dry rocky thickets, Dartmouth; wooded roadside, Armdale (Dutch Village).

At the latter station *B. caerulea* was associated with the abundant *B. caerulea-grandis* and *B. populifolia*; at Dartmouth, only a few miles away, it was with at least *B. populifolia*; and at its Vermont

stations it occurs with *B. caerulea-grandis* and *B. populifolia*. In foliage *B. caerulea* is a good combination of the two; in fruiting aments it is much closer to *B. populifolia*, having short horizontally divergent and puberulent scales, and in a large proportion of specimens there is only a solitary staminate ament, *B. caerulea-grandis* more often having 2 or 3. The present evidence seems to indicate that *B. caerulea* is a hybrid of *B. caerulea-grandis* and *B. populifolia* and it is noteworthy that on one of his sheets of *B. caerulea* in the Gray Herbarium Blanchard originally wrote: "It may be a hybrid between *pendula* [of eastern America, i. e. *B. caerulea-grandis*] and *populifolia*."

ALNUS INCANA (L.) Moench, var. HYPOCHLORA Call. Recorded from a single station in RHODORA, xxiii. 257 (1922). Frequent eastward at least to Lunenburg Co.

QUERCUS BOREALIS Michx. f., var. MAXIMA (Marsh.) Ashe, Proc. Soc. Am. Foresters, xi. 90 (1916). *Q. rubra* of authors, not L. Although the common oak of Nova Scotia is typical *Q. borealis* (*Q. rubra*, var. *ambigua*), the southern extreme with flattish cups was twice collected. YARMOUTH Co.: dry woods near Canoe Lake. ANNAPOLIS Co.: woods bordering Boot Lake.

***Polygonum Bistorta* L. Sp. Pl. i. 360 (1753). The European Bistort is somewhat naturalized (at least two obviously increasing clumps) in a field in Victoria Park, Truro.

P. MUHLENBERGII (Meisn.) Watson. Additional stations are, in YARMOUTH Co.: cobbly beach of Ogden Lake; rocky swale bordering Dominick Lake east of Springhaven.

*P. PENSYLVANICUM L., var. GENUINUM Fernald, RHODORA, xix. 72 (1917). ANNAPOLIS Co.: exsiccated clay roadway bordering salt marsh, Annapolis Royal; first record from east of Massachusetts, previous records belonging to var. LAEVIGATUM Fernald.

P. ROBUSTIUS (Small) Fernald, RHODORA, xxiii. 147 (1921). Additional stations, in YARMOUTH Co.: cobbly beach of Ogden Lake. DIGBY Co.: rocky thicket bordering West Branch of Tusket R., Havelock; rocky thicket bordering Wentworth Lake. ANNAPOLIS Co.: in peat and granite gravel bordering outlet of Lamb's Lake.

**P. PURITANORUM Fernald, RHODORA, xxi. 141 (1919). ANNAPOLIS Co.: in sand or gravel among granite boulders, beach of Grand Lake; first record outside southeastern Massachusetts.

P. HYDROPIPEROIDES Michx. Common eastward at least to Annapolis and Lunenburg Cos.

P. HYDROPIPEROIDES, var. DIGITATUM Fernald, RHODORA, xxiii. 260 (1922). Typical *P. hydropiperoides* was in maturity from mid-July through August, but the original colony of var. *digitatum*, when visited on August 23, barely showed color in the inflorescences: the original collection was made (in good flower) in October, 1920.

P. **hydropiperoides × **robustius**, n. hybr., caule decumbente

basi valde lignescenti stoloniferoque plerumque 3–5 mm. crasso; ramis floriferis adscendentibus 0.3–1 m. longis; foliis anguste ellipticis vel elliptico-lanceolatis acuminatis vel acutis 0.5–2 dm. longis 0.8–4 cm. latis; ocreis laxe cylindricis strigosis ciliatis, ciliis 2–5 mm. longis; pedunculis erectis elongatis; spicis filiformibus plerumque 0.4–1 dm. longis alternifloris, rhachi purpurascenti; ocreolis ciliatis: perianthiis lacteis 2–3 mm. longis, epunctatis vel rare punctatis: achaeniis vacuis.

Nova Scotia: in great abundance in peat and granite gravel bordering outlet of Lamb's Lake, Annapolis Co.. July 19, 1921 (foliage), *Fernald, Bartram, Long & Fassett*, no. 23,802, August 29, *Fernald & Long*, no. 23,803 (type in Gray Herb.) and in *Pl. Exsicc. Gray.*, September 16, *Donald McPherson*, no. 23,804.

Exactly combining the aspect and characters of the two species, both of which occur with or near it. In its coarse habit with stout subligneous base nearer *P. robustius*; in foliage intermediate; in the spike showing the slender habit of *P. hydropiperoides* and the purple color of the rhachis, but in the large milk-white flowers and the great length of the spikes suggesting *P. robustius*. Practically all the achenes are empty. Out of 135 sheets of specimens collected on August 29 we were able to secure only 5 partially filled achenes; while a mass of 100 or more older inflorescences collected in September by Mr. McPherson yielded no good achenes.

Chenopodium Bonus-Henricus L. Annapolis Co.: locally abundant, roadsides and waste ground, Annapolis Royal.

Brasenia Schreberi Gmel. Lakes of Shelburne Co.

Corydalis sempervirens (L.) Pers. Apparently rare. Seen only in recently cleared land in Digby Co. (Wentworth Lake) and Lunenburg Co. (Bridgewater).

Subularia aquatica L. Many additional stations in Digby and Lunenburg Cos.

Sarracenia purpurea L., forma **heterophylla** (Eaton), n. comb. *S. heterophylla* Eaton, Man. ed. 4: 445. (1824). *S. purpurea*, var. *heterophylla* (Eaton) Torr. Rep. Bot. Dept. Surv. N. Y. Assembly No. 50: 120 (1839), Fl. N. Y. i. 41 (1843). *S. purpurea heterophylla* (Eaton) Britton, Mem. Torr. Bot. Cl. v. 176 (1894).

This very striking color-form, with yellow-green sepals, yellowish petals and stigma and pale-green leaves, occurs abundantly at the boggy margin of Young's Lake, North Mt., Belle Isle (Annapolis Co.).

Pyrus arbutifolia (L.) L. f. Shelburne Co.: wet thicket bordering Harper Lake.

Amelanchier stolonifera Wiegand. Additional stations in Yarmouth Co.

A. STOLONIFERA, var. LUCIDA Fernald, RHODORA, xxiii. 267 (1922). Additional stations in Yarmouth, Shelburne and Lunenburg Cos.

A. LAEVIS Willd., var. NITIDA (Wiegand) Fernald, RHODORA, xxiii. 267 (1922). Many stations from Yarmouth Co. to Halifax Co.

*POTENTILLA PUMILA Poir. LUNENBURG CO.: abundant in dry open soil and at borders of pine woods about Bridgewater; first east of the lower Penobscot. Previously known in Canada only from southern Ontario.—J. M. Macoun, Ott. Nat. xvi. 214 (1903).

**Filipendula rubra* (Hill) Robinson. Damp roadside-thicket, Yarmouth.

RUBUS ODORATUS L. var. **malachophyllus, n. var. foliis utrinque densissime pilosis vel subvelutinis supra juventate et subtus ad nervos atro-glandulosis.

Leaves densely pilose or almost velvety on both surfaces, the upper surfaces of the young and the nerves beneath black-glandular.—NOVA SCOTIA: thicket, Belleville, Yarmouth Co., July 23, 1921, *Fernald, Bartram & Long*, no. 23,974 (TYPE in Gray Herb.).

Typical *Rubus odoratus* has the leaves nearly or often quite glabrous on the upper surfaces and only sparingly pubescent on the nerves beneath, and only rarely in the typical continental plant do glands occur upon the leaf-surfaces. Lindsay records *R. odoratus* as "cult'ed at Annap[oli]s., pos'bly fm. w[ild] plants."

***R. illecebrosus* Focke, Abh. Nat. Ver. Bremen, xvi. 278 (1899).—An ornamental garden plant from Japan, tending to spread from cultivation at Annapolis Royal.

R. ALLEGHENIENSIS Porter. Much of the Nova Scotia shrub is uncharacteristic, having comparatively short and leafy-bracted racemes, and subglobose berries with coarse drupelets of inferior flavor. This may prove to be separable from *R. alleghoniensis*.

R. GLANDICAULIS Blanchard. The typical form of the species collected in HANTS CO.: gravelly thicket near Uniacke Lake.

R. AMNICOLA Blanchard. YARMOUTH CO.: thickets and clearings bordering savannah along South Branch of Tusket River, Quinan; high-arching shrubs, very prolific, bearing fruit of the richest quality. Should be cultivated.

R. MULTIFORMIS Blanchard. Many additional stations, especially in Shelburne Co., where this low-arching or trailing species is characteristic of boggy thickets and river- and lake-margins.

R. BIFORMISPINUS Blanchard. One of the most characteristic coarse trailers of the sandy roadsides and railroad embankments in southern Yarmouth and Shelburne Cos. The lustrous foliage of darkest green is very handsome and the stout sprawling canes are often nearly 1 cm. in diameter; fruit inferior.

R. RECURVANS Blanchard. Frequent from Yarmouth Co. to Lunenburg Co. Where well developed, as about Gavelton or in thickets by Ogden Lake, furnishing the choicest blackberries in the province.

R. RECURVICAULIS Blanchard. The observations of 1920 were confirmed: that this is one of the commonest species of rocky or gravelly habitats.

R. VERMONTANUS Blanchard Additional stations in Annapolis and Shelburne Cos.

R. TARDATUS Blanchard. Additional stations in Yarmouth, Shelburne and Hants Cos.

R. ABBREVIANS Blanchard. Frequent in Yarmouth and Shelburne Cos. Additional stations in YARMOUTH Co.: sphagnous thicket, Markland (Cape Forchu), nos. 23,982, 24,025; gravelly railroad bank, Tusket, no. 23,996; open rocky thicket near Vaughan (Tusket) Lake, Gavelton, no. 24,016. SHELBURNE Co.: gravelly railroad bank, Atwood Brook, no. 23,987; rocky thicket bordering Welshtown (Birchtown) Lake, no. 24,003.

R. ARCUANS Fernald & St. John. Very luxuriant on the gravelly railroad banks from Shelburne to Sable River.

R. JACENS Blanchard. Additional stations northward to Digby Neck and eastward to Lunenburg Co.

**ROSA NITIDA × PALUSTRIS Rydb. N. A. Fl. xxii. 496 (1918). *R. carolina* × *nitida* Crépin, RHODORA, ii. 113 (1900). *R. carolina*, var. *setigera* Crepin, l. c. A characteristic clump in wet rocky thicket bordering Sparrel Lake, southeast of Hasset, Dibgy Co.

*R. NITIDA × VIRGINIANA Rydb. l. c. 502 (1918). Border of spruce swamp, Markland (Cape Forchu).

**R. OBOVATA Raf. as interpreted by Rydberg l. c. 499 (1918). Apparently a well defined species. Our material is from YARMOUTH Co.: damp thicket bordering Brazil Lake. LUNENBURG Co.: borders of dry pine and oak woods on steep slopes along Lahave River, Bridgewater (quite like the southern specimens).

Cytisus scoparius (L.) Link. Long known from Shelburne; but now rapidly covering all open ground of roadside, pasture and woods-border along the main road from Shelburne to Jordon Falls, especially in the vicinity of Swanburg Lake. The plant is locally gathered for the drug market.

Trifolium dubium Sibth. Northeastward to Weymouth.

**Vicia sepium* L. Border of field, Annapolis Royal.

APIOS TUBEROSA Moench. Many additional stations in Digby, Annapolis and Lunenburg Cos. In 1920 the plant appeared always sterile, in 1921 it flowered heavily.

GERANIUM BICKNELLII Britton. Seen only in a recently burned clearing west of Bridgewater—one of the most characteristic habitats of the plant elsewhere. Earlier records of *G. carolinianum* undoubtedly belong here.

ILEX VERTICILLATA (L.) Gray, var. TENUIFOLIA (Torr.) Wats. SHELBURNE Co.: rocky shore of Deception Lake.

I. VERTICILLATA, var. FASTIGIATA (Bicknell) Fernald, RHODORA, xxiii. 274 (1922). Additional stations in Yarmouth and Shelburne Cos.

ACER RUBRUM L., var. TRIDENS Wood. HALIFAX CO.: mixed woods, Armdale (Dutch Village).

**A. Negundo* L. Well naturalized on banks of Lahave River. Bridgewater.

Vitis labrusca × *vinifera*. A single vigorous vine of one of the commonly cultivated grapes is growing in the gravelly thicket at the foot of a railroad bank near Uniacke Lake; obviously sprung from seed thrown from the train.

HYPERICUM DISSIMULATUM Bicknell. Additional stations in Digby, Yarmouth and Lunenburg Cos.

ELATINE MINIMA (Nutt.) Fisch. & Meyer. Many additional stations in Annapolis, Lunenburg and Hants Cos.

HUDSONIA ERICOIDES L. SHELBURNE CO.: dry rocky and sandy barrens, Shelburne.

VIOLA LABRADORICA Schrank. The Nova Scotia material passing as *V. conspersa* has the very small and nearly entire stipules of *V. labradorica*. In foliage it is sometimes quite like the latter, at other times like the former and its exact identification must await better material.

Daphne Mezereum L. Thoroughly naturalized and very handsome in roadside-thickets and on clay banks in the gypsiferous or basaltic regions from Annapolis Co. to Hants Co.

Shepherdia canadensis (L.) Nutt. A single shrub, not yet destroyed, on an open bank near gypsum quarries, Windsor.

DECODON VERTICILLATUS (L.) Ell., var. LAEVIGATUS T. & G. Additional stations, for DIGBY CO.: among granite boulders bordering Cedar Lake, New Tusket. SHELBURNE CO.: quaking sphagnous border of Western Lake, Birchtown Brook; peaty margin of McKay's Lake, Middle Ohio.

RHEXIA VIRGINICA L. Additional stations, for YARMOUTH CO.: peaty and cobbly beach of St John (Wilson's) Lake; very abundant, peaty swale bordering Canoe Lake. SHELBURNE CO.: upper border of cobbly beach, Welshtown (Birchtown) Lake; upper border of cobbly beach, McKay's Lake, Middle Ohio. LUNENBURG CO.: upper border of gravelly beach, Feindel's Lake, west of Bridgewater.

*EPILOBIUM COLORATUM Muhl. Open spot with both native and introduced plants near railroad station, Weymouth. Should be sought in more natural habitats. First east of the Penobscot region, the earlier records from eastern Canada resting on *E. glandulosum* vars. *adenocaulon* (Haussk.) Fernald and *occidentale* (Trel.) Fernald.

OENOTHERA HYBRIDA Michx. Fl. Bor.-Am. i. 225 (1803); Blake, RHODORA, xx. 51 (1918). *O. fruticosa*, var. *hirsuta* Nutt. in T. & G. Fl. i. 496 (1840). *Kneiffia tetragona hybrida* (Michx.) Pennell, Bull Torr. Bot. Cl. xlvi. 371 (1919).—DIGBY CO.: dry sandy open soil of pastures and roadsides, Ashmore. Doubtless this is the plant reported by others from western Nova Scotia as *O. fruticosa*.

Dr. F. W. Pennell objects to the use of the perfectly identified and

typified name *O. hybrida* Michx. because, in taking up this earliest valid specific name, "Dr. Blake has hardly improved nomenclature—surely not in the opinion of our genetical friends—by the substitution of the name '*hybrida.*'" Under the generic name *Oenothera* this specific name is, naturally, unfortunate but "No one is authorized to reject, change or modify a name (or combination of names) because it is badly chosen," etc. (Internat. Rules, Art. 50) and under the generic name *Kneiffia*, which Pennell maintains, it could not be very embarrassing to "our genetical friends," since they have not specially concerned themselves with that subgenus (or genus). As a result of his objection to the name *Oenothera hybrida* Michx. Pennell made a special search of literature in "the hope of finding for this species some appropriate name." This he feels that he has found in *O. tetragona* Roth, Catalecta, ii. 39 (1800), a name which antedates by three years Michaux's publication. Pennell has seen no specimen but is satisfied that "the full description would apply to the plant here considered." Whether Roth had a plant which is conspecific with *O. hybrida* Michx. (the *Kneiffia fruticosa* of the Illustrated Flora) is certainly very doubtful. Roth calls for a plant with dichotomus branching (Caulis . . . dichotomus), a habit not shown in any material I have seen; Roth calls for oval, obtuse, entire, recurved leaves about 3 inches long and 1 inch wide (Folia . . . oualia, obtusa, integra, . . . plerumque recurua, tres vncias circiter longa vnciamque in medio lata), but the Illustrated Flora correctly describes our plant with "Leaves lanceolate, ovate-lanceolate or oval-lanceolate, acute or obtusish . . . repand-denticulate, or rarely nearly entire," while Pennell's key-characters describe his *K. tetragona* with "Leaves lanceolate." Roth knew perfectly well that his *O. tetragona* did not have lanceolate and repand leaves, for in contrasting it with *O. tetraptera* Cav. he said: "*Foliis* oualibus, integris; nec lanceolatis, a basi ad medium vsque pinnati fidis." Similarly in distinguishing it from *O. fruticosa* he said: "*Foliis* oualibus, obtusis; nec lanceolatis, acutis." And surely the spreading-ascending leaves of *O. hybrida* are not well described as "recurva." The calyx-tube of *O. hybrida* is very slender, well described as filiform, but Roth described the calyx-tube of *O. tetragona* as cylindric (cylindraceus . . . crassitie pedicelli) and emphasized its thickness by contrasting it with that of *O. fruticosa*: "*Calycis tubo* cylindraceo; nec filiformi, angustissimo." Other points, such as the crenate petals

described by Roth, might be discussed, but enough has already been emphasized to indicate that Roth's detailed description of *O. tetragona* departs in very many points from *O. hybrida* and that those who wish to throw out Michaux's specific name must find an earlier name which is more clearly synonymous with it than is *O. tetragona* Roth.

MYRIOPHYLLUM HUMILE (Raf.) Morong YARMOUTH Co.: Vaughan (Tusket) Lake. LUNENBURG Co.: Feindel's Lake, west of Bridgewater; Rhodeniser Lake. HANTS Co.: Uniacke Lake.

M. TENELLUM Bigel. The tremendous variation in the stature of this species is illustrated by our collections. At the gravelly margin of Uniacke Lake (Hants) the plant was flowering when 2.5–5 cm. high; but in a peaty cove of Little Meteghan Lake the coarse stems reached a height of 5.5 dm.

PROSERPINACA PALUSTRIS L. At various stations from Yarmouth Co. to Annapolis and Lunenburg Cos.; in the latter region sometimes reaching remarkable development: 0.5 m. high, with emersed leaves up to 8.5 cm. long and 1.3 cm. broad.

P. PECTINATA Lam. Additional stations, for YARMOUTH Co: wet savannahs bordering Goven and Kegeshook Lakes and South Branch by Tusket River, Quinan. LUNENBURG Co.: sphagnous swale west of Italy Cross; sandy and gravelly beach of Blystner Lake; peaty bottom of dried-out mill-pond north of Blockhouse.

**HYDROCOTYLE UMBELLATA L. YARMOUTH Co.: wet sandy and gravelly margin of St. John (Wilson's) Lake; first time east of Massachusetts. Very rare and local and appearing like a waif washed down from some as yet undiscovered station farther up the valley of the Tusket.

H. AMERICANA L. Frequent eastward at least to Annapolis and Lunenburg Cos.

**Aethusa Cynapium* L. Waste ground in barn-yard, Shelburne.

CORNUS STOLONIFERA Michx. Westward to Annapolis Co.

PYROLA CHLORANTHA Sw. At various stations in Digby, Annapolis and Hants Cos. Var. *paucifolia* Fernald seems hardly worth maintaining.

P. ROTUNDIFOLIA L., var. ARENARIA Mert. & Koch. Additional stations eastward to Hants Co.

*VACCINIUM CORYMBOSUM L. The typical form of the species we have only from thickets bordering Goven Lake, Yarmouth Co.

V. CORYMBOSUM, var. AMOENUM (Ait.) Gray. Additional stations eastward to the Roseway River, Shelburne Co.

V. CORYMBOSUM, var. PALLIDUM (Ait.) Gray. Additional stations eastward to Welchtown (Birchtown) Lake, Shelburne Co.

PRIMULA FARINOSA L., var. MACROPODA Fernald. YARMOUTH Co.: turfy crests and slopes of exposed headlands, Markland (Cape Forchu); reported to us from headlands near Pembroke Shore.

SAMOLUS FLORIBUNDUS HBK. SHELBURNE Co.: border of salt

marsh, Port Clyde. LUNENBURG Co.: brackish mud by Lahave River, Bridgewater.

LYSIMACHIA TERRESTRIS (L.) BSP. In boggy thickets reaching a full meter in height; in dry sands fruiting at a height of 2 dm.

SABATIA KENNEDYANA Fernald. Many additional stations, all in the Tusket Valley, eastward to Canoe Lake.

**S. KENNEDYANA, forma CANDIDA Fernald, RHODORA, xviii. 151 (1916). The albino-flowered form local by Vagahan (Tusket) and Canoe Lake.

S. KENNEDYANA, forma **eucycla, n. f., lobis corollae late obovatis plus minusve imbricatis.

Lobes of the corolla broadly obovate, more or less imbricated.—NOVA SCOTIA: wet peaty margin of Vaughan (Tusket) Lake, Gavelton, Yarmouth Co., August 13, 1921, *Fernald & Long*, no. 24,354 (TYPE in Gray Herb.).

The ordinary form of *S. Kennedyana* has the segments narrowly cuneate-obovate, averaging two-fifths as broad as long, and with only rarely overlapping margins. Forma *eucycla*, with the lobes five-sevenths as broad as long and with usually overlapping margins, forms a colony of considerable extent at one point on Vaughan Lake.

BARTONIA VIRGINICA (L.) BSP. Many additional stations in Yarmouth and Shelburne Cos. Plants from *Corema*-barrens north of Jordon Falls have very large flowers, with calyx up to 4.5 mm. long.

B PANICULATA (Michx.) Robinson. Many additional stations in Digby, Yarmouth, Shelburne, Lunenburg and Halifax Cos.

B. PANICULATA, var. INTERMEDIA Fernald, RHODORA, xxiii. 287 (1922). Many additional stations in Yarmouth, Shelburne and Lunenburg Cos.

B. PANICULATA, var. SABULONENSIS Fernald, l. c. 288 (1922). Colonies closely approaching the Sable Island plant in SHELBURNE Co.: wet sandy beach, Harper Lake. LUNENBURG Co.: peaty and gravelly beach of Feindel's Lake, west of Bridgewater.

APOCYNUM CANNABINUM L. LUNENBURG Co.: cobbly beach of Wentzell Lake.

ASCLEPIAS INCARNATA L., var. PULCHRA (Ehrh.) Pers. DIGBY Co.: rocky thicket bordering Wentworth Lake. YARMOUTH Co.: thicket at upper border of cobbly beach, Parr Lake. LUNENBURG Co.: peaty margin of a dried-out mill-pond north of Blockhouse.

The only other Canadian records are from New Germany, Lunenburg Co.—J. M. Macoun, Ott. Nat. xv. 77 (1901).

(To be continued.)

NOTES ON THE FLORA OF WESTERN NOVA SCOTIA

1921.

M. L. Fernald.

(*Continued from page 180.*)

Cuscuta Gronovii Willd. *C. vulgivaga* Engelm. Am. Journ. Sci. xliii. 338 (1842). *C. Gronovii α vulgivaga* Engelm. Trans. Acad. Sci. St. Louis i. 508 (1859); Yuncker. Revis. N. A. and W. I. Cuscuta,

65 (1921). Lunenburg Co.: wet thickets and swales back of brackish shore of Lahave River, Bridgewater; upper border of cobbly beach, Wentzell Lake.

Var. *vulgivaga* is the typical form of the species as was clearly indicated by Engelmann in publishing it: "It is Willdenow's original *C. Gronovii*, in his Hb. nro. 3160."

**C. Gronovii, var. latiflora Engelm. Trans. Acad. Sci. St. Louis, i. 508 (1859); Yuncker, l. c. (1921). *C. Saururi* Engelm. Am. Journ. Sci. xliii. 339 (1842). Yarmouth Co.: thickets and damp shores, Quinan, Argyle and Belleville. A coastal plain variety recorded by Yuncker as extending from Texas to southern Illinois and New Jersey.

All our material of var. *latiflora* from Nova Scotia has large, depressed-globose or oblate capsules, in maturity 4–5 mm. broad, and unusually large seeds, 2.2–3 mm. long. Its corolla and anthers are exactly those of the southern plant and, although Yuncker in his recently published *Revision of the North American and West Indian Species of Cuscuta* excludes *C. Gronovii* (in his key, p. 47) from the group characterized by "Capsule globose, more or less depressed," and places it (p. 48) in the group with "Capsule globose-ovoid to conic or long-beaked," many of the specimens placed by him under this species have definitely depressed-globose capsules like the plant of western Nova Scotia. Similarly, although Yuncker's description of *C. Gronovii* calls for seeds "about 1.5 mm. long," many plants which he has identified have seeds up to 2.3 mm. long. The old corollas of *C. Gronovii* and var. *latiflora* sometimes crown the capsule. In such cases there is great difficulty in distinguishing the plants with depressed-globose capsules from *C. Cephalanthi* Engelm. In the latter species, however, the anthers are smaller and more rounded than in *C. Gronovii*.

Mertensia maritima (L.) S. F. Gray, forma albiflora Fernald, Rhodora, xxiii. 288 (1922). Rocky barrier beach, Markland (Cape Forchu), and very abundant and uniform on the barrier beach at East Jordan.

Teucrium canadense L., var. littorale (Bicknell) Fernald. Shelburne Co.: crest of barrier beach, East Jordan.

**Solanum Dulcamara L., var. *villosissimum* Desv. Pl. Angers, 112 (1818). β. *tomentosum* Koch, Syn. 507 (1838). γ. *marinum* Bab. Man. 210 (1843). *S. littorale* Raab in Flora, ii. 414 (1819).—Much of the material collected in western Nova Scotia, at various stations especially near the coast of Yarmouth, Shelburne and Annapolis Cos., belongs to the variety with velvety or densely pilose foliage.

We have it from various stations in Newfoundland, Quebec, and Massachusetts.

GRATIOLA AUREA Pursh. Common eastward to Annapolis and Lunenburg Cos.

Veronica agrestis L. Waste ground, Dartmouth.

AGALINIS NEOSCOTICA (Greene) Fernald, RHODORA, xxiii. 139 (1921). Many additional stations including some in Shelburne Co.

**A. MARITIMA Raf. *Gerardia maritima* Raf. YARMOUTH Co.: very abundant on the salt marsh along Argyle River, Argyle Head. Heretofore unknown east of York Co., Maine.

UTRICULARIA GEMINISCAPA Benj. Additional stations in Shelburne, Lunenburg and Halifax Cos.

U. MINOR L. Additional stations in Digby Co.

U. GIBBA L. Additional stations, in YARMOUTH Co.: forming a filmy turf in quagmire-margin of Sloane Lake, Carleton. LUNENBURG Co.: forming compact mats in shallow pools at outlet of Hebb's Lake, Bridgewater; peaty quagmire-margin of Frank Lake and of a near-by small pond, Upper Cornwall.

U. PURPUREA Walt. Frequent or common eastward to Hants Co.

U. CORNUTA Michx. A colony in exposed peat and sand by Rhodeniser Lake, Lunenburg Co., is noteworthy on account of its forking stems—with 2 or 3 long branches.

**CONOPHOLIS AMERICANA (L. f.) Wallr. LUNENBURG Co.: dry pine and oak woods on steep slopes along Lahave River, Bridgewater; locally abundant, many stems springing from deep-seated thick bases attached to oak-roots. Freshly bruised plant with a strong odor of cider.

LITTORELLA AMERICANA Fernald. On the shores of Shubenacadie Grand Lake *Littorella* did not flower in 1920, owing to the high water; but in 1921 it formed freely flowering carpets stranded on the sandy and shingly beach.

Plantago lanceolata L. There are two well defined varieties of *Plantago lanceolata* naturalized in America and a second species which has been confused with them. The varieties are distinguished as follows.

Spike at beginning of anthesis narrowly ovoid-conic, tapering to apex; in fruit cylindric and obtuse, 1.5–8 cm. long: leaf-blades 0.5–2.3 dm. long, 0.6–4 cm. broad: scapes up to 8 dm. tall ..... *P. lanceolata* (typical).

Spike at beginning of anthesis subglobose, rounded to apex; in fruit subglobose to cylindric and obtuse, 0.5–2.3 cm. long: leaf-blades 0.2–1.2 dm. long, 0.3–2 cm. broad: scapes 0.3–4.5 dm. tall.

Upper leaf-surfaces green, glabrous or sparsely pubescent. Var. *sphaerostachya.*

Upper leaf-surfaces gray with abundant long hairs. Var. *sphaerostachya*, forma *eriophora.*

P. lanceolata L. (typical). Generally naturalized from Newfoundland to British Colombia and southward. A locally abundant variant

has the spike branching sometimes with a few, more often with many short and densely crowded branches.

**Var. *sphaerostachya* Mert. & Koch in Roehling, Deutschl. Fl. i. 803 (1823). γ. *pumila* Koch, Syn. 597 (1837). β. *capitellata* Schultz, Fl. Pfalz, 380 (1846). δ. *capitata* Dcne. in A. DC. Prodr. xiii. pt. 1: 715 (1852). *P. microcephala* Royle acc. to Barneoud, Mon. Plant. 29 (1845), not Poir. *P. sphaerostachya* (Mert. & Koch) Kern. Schedae ad Fl. exsicc. Austro-Hung. iv. 71 (1886), not Hegetschw. Fl. Schweiz, 116 (1840).—Fields and roadsides, Newfoundland; Nova Scotia; southern New England; California to British Columbia.

**Var. *sphaerostachya*, forma *eriophora* (Hoffmansegg & Link) Beck von Man. Fl. Nied.-Oesterr. ii. 1093 (1893). *P. eriophora* Hoffmansegg & Link, Fl. Port. i. 423 (1809). *P. hungarica* Waldst. & Kit. Pl. Rar. Hung. iii. 225, t. 203 (1812). *P. lanata* Host. Fl. Austr. i. 210 (1827). *P. lanceolata* δ. *lanuginosa* Koch, Syn. 597 (1837).—Nova Scotia; southern New England; Oregon.

A closely related species, *P. altissima* L. Sp. ed. 2, i. 164 (1762); Kern, Ost. Bot. Zeit. xxv. 59 (1875); Beck von Man. Fl. Nied.-Oesterr. ii. 1093 (1893), was collected by the late H. S. Clark somewhere on the "Connecticut coast" in 1899. The label gives no further information but is sufficient indication that the plant is to be watched for. *P. altissima* is a stouter plant than *P. lanceolata*, with heavy, creeping root, large leaves (up to 4 dm. long and 4 cm. broad) glabrous upon both surfaces; stout scapes 0.6–1. m high; and flowers 6–7 mm. broad (in *P. lanceolata* mostly under 5 mm.).

*Cephalanthus occidentalis L. Shelburne Co.: rocky shore of Deception Lake; among granite boulders by Lake John; at both stations scarce and local. Mr. R. H. Wetmore informs me that he has found *Cephalanthus* on Cameron Lake (head of Medway River), Queens Co.

Viburnum alnifolium Marsh. Rare in Yarmouth Co.: thickets and mixed woods near Lake George. Becoming frequent in Digby Co. Thence eastward through the northern and central region at least to Halifax Co.

Solidago latifolia L. Lunenburg Co.: shaded ledges by Lahave River above Bridgewater

Solidago bicolor L. Shelburne Co.: from Shelburne eastward,

*S. uniligulata (DC.) Porter, var. neglecta (T. & G.) Fernald, Rhodora, xxiii. 292 (1922). The plants in a spruce swamp at Markland (Cape Forchu), Yarmouth Co., are thoroughly characteristic of the variety which, in extreme development, we have not had from east of southern Maine.

S. Elliottii × rugosa. One colony, apparently of this origin, on a gravelly bank south of Belleville, Yarmouth Co.

S. CANADENSIS × UNILIGULATA. One clump, apparently of this origin, in a thicket near Five-River (Morris), Lake Shelburne Co.

S. SEROTINA Ait., var. GIGANTEA (Ait.) Gray. Various stations from Yarmouth Co. to Lunenburg Co.

SOLIDAGO TENUIFOLIA Pursh. Many additional stations from Yarmouth and Digby Cos. to Halifax Co.

*ASTER UNDULATUS L. LUNENBURG CO.: frequent in dry thickets and borders of woods about Bridgewater and northward at least to Wentzell Lake.

*ASTER LINDLEYANUS T. & G. HANTS CO.: border of old hillside woods, Mt. Uniacke.

*ANTENNARIA PARLINII Fernald. LUNENBURG CO.: abundant at the border of dry pine and oak woods on steep slopes along Lahave River, Bridgewater.

ANAPHALIS MARGARITACEA (L.) B. & H., forma **anochlora, n. f., foliis lineari-lanceolatis supra viridibus glabris sub inflorescentia valde reductis.

Leaves linear-lanceolate, green and glabrous above, much reduced below the inflorescence.—Occasional throughout the range of the typical form. TYPE: dry clearings and burns near Five-River (Morris) Lake, Shelburne Co., Nova Scotia, September 10, 1921, *Fernald & Long*, no. 24,670, in Gray Herb.

Forma *anochlora*, on account of its bright green upper leaf-surfaces, is often sent out as var. *occidentalis* Greene. That variety, of more boreal range than the slender-leaved *A. margaritacea* and forma *anochlora*, has the leaves of more oblong tendency and scarcely reduced in size below the inflorescence. For discussion of it see RHODORA, xiii. 25–37 (1911).

Ambrosia trifida L. Waste ground, Dartmouth.

RUDBECKIA LACINIATA L., var. **gaspereauensis, n. var., foliis subtus et petiolis et rhachibus pilosis.

Lower surfaces of leaves, petioles and rhachises pilose.—NOVA SCOTIA: alluvial soil in thickets close to shore or on the strand of streams and brooks of the Gaspereau River system, Kings County. The type material collected at the border of an alder thicket by Black River (tributary to the Gaspereau), August 31, 1921, by Prof. *H. G. Perry* (TYPE in Gray Herb.).

This indigenous and isolated Nova Scotian variety differs from the continental plant in the development of long pubescence, typical *R. laciniata* being glabrous or merely scabrous.

COREOPSIS ROSEA Nutt. Additional stations, all in YARMOUTH CO.: Salmon (Greenville) Lake; Goven, St. John (Wilson) and Gilfilling Lakes.

Bidens cernua in eastern America. *Bidens cernua* L. is a highly variable species with several well defined varieties in northeastern America. It belongs to a group of three species with simple leaves and achenes with a convex cartilaginous summit. These three species may be distinguished as follows.

Mature disk (except in depauperate extremes) 1.3–2.8 cm. broad: fruiting heads often nodding: outer involucre reflexed, spreading or merely subascending: disk-corollas 4–5 mm. long, 5-toothed: anthers exserted, purple-black: achenes not conspicuously striate between the margins and midribs or keels; the central 1.8–2.5 mm. broad.

Achenes straight and flat, not winged nor strongly keeled, deep-brown or purplish; the outer 6–8 mm. long, with marginal awns 2.8–4.5 mm. long; the central 8–9.5 mm. long, with marginal awns 3.5–5 mm. long: stem firm and usually smooth; its rooting base up to 6 dm. long: outer involucre rarely longer than the inner: chaff reddish-tipped: rays 1.5–3 cm. long.....*B. laevis.*

Achenes curved, with almost wing-like pale margins and keels, olivaceous; the outer 3.3–6.3 mm. long, with marginal awns 2–2.8 mm. long; the central 4.2–7.8 mm. long, with marginal awns 2.6–4 mm. long: stem soft and usually somewhat hispid; its rooting base rarely 1 dm. long: outer involucre mostly longer than the inner: chaff yellow-tipped: rays wanting or at most 1.7 cm. long.....*B. cernua.*

Mature disk rarely 1.5 cm. broad: fruiting heads erect: outer involucre ascending: disk-corollas 3.5–4 mm. long, 4-toothed: anthers included, pale: achenes distinctly 7–15-striate on each face; the central 1.4–1.9 mm. broad, flat, olive-brown or drab.....*B. hyperborea.*

Bidens laevis is not specially variable with us; the variations of *B. hyperborea* have recently been discussed;[1] and to round out the treatment of this group the northeastern varieties of *B. cernua* are here considered. Our variations of this species are as follows.

Stems stoutish, 0.25–1 cm. in diameter at base, commonly branching, 0.5–1.8 m. high: leaves sessile or at most narrowed at base, thickish, 0.2–2 dm. long; heads commonly numerous, broadly hemispherical, many-flowered; the primary ones with disks 1–2.7 cm. broad, nodding in fruit: outer involucre of 5–10 bracts; inner of about 8 bracts 6–12 mm. long.

Leaves tapering to long acuminate-attenuate tips; the primary with 4–24 pairs of sharp serrations: bracts of outer involucre linear to lanceolate, acute or acutish.

Leaves with broad connate or subconnate bases, scarcely narrowed below the middle.

Leaves linear to oblanceolate, with 4–13 pairs of coarse teeth 1–5 mm. high.....*B. cernua* (typical).

[1] Rhodora, xx. 146–150 (1918).

Leaves linear- to lance-oblong, with 12-24 pairs of fine teeth scarcely 1 mm. high ..... Var. *integra.*
Leaves conspicuously narrowed at base, elliptic-lanceolate ..... Var. *elliptica.*
Leaves mostly blunt or round-tipped; the primary ones entire or with 1–6 pairs of remote teeth: bracts of outer involucre oblong to spatulate, with obtuse or rounded tips ..... Var. *oligodonta.*
Stem capillary, simple or only slightly forking, 0.2–2 dm. high: leaves petioled, oblanceolate or spatulate, thin, 0.4–2.5 (rarely –4) cm. long: heads solitary or very few, campanulate, few-flowered, with disks 1.5–10 mm. broad, scarcely nodding in fruit: outer involucre of 2–6 bracts; inner involucre of 3–6 bracts 2–7 mm. long ..... Var. *minima.*

B. CERNUA (typical). Sloughs, springs, pools and wet shores, extending northeastward to Chicoutimi, Rimouski and Bonaventure Cos., QUEBEC, MADGALEN ISLANDS and Cape Breton, NOVA SCOTIA; Eurasia.

In Nova Scotia unknown from west of Annapolis and Lunenburg Cos.

**Var. INTEGRA Wiegand, Bull. Torr. Bot. Cl. xxvi. 418 (1899).—PRINCE EDWARD ISLAND; Cape Cod, MASSACHUSETTS; Illinois to western North Carolina, Oklahoma and South Dakota.

Var. ELLIPTICA Wiegand l. c. 417 (1899). *B. elliptica* (Wiegand) Gleason, Ohio Nat. v. 317 (1905).—Extending northeastward to the Ottawa Valley, ONTARIO and QUEBEC, and PRINCE EDWARD ISLAND.

Var. OLIGODONTA Fernald & St. John, RHODORA, xvii. 25 (1915).—Brackish or saline shores, MAGDALEN ISLANDS, PRINCE EDWARD ISLAND and MASSACHUSETTS locally inland to western NEW YORK.

**Var. MINIMA (Huds.) DC. Prodr. v. 595 (1836). *B. minima* Huds. Fl. Angl. 310 (1762).—Bogs and shallow pools, MAGDALEN ISLANDS to southern NEW HAMPSHIRE and western NEW YORK and northwestward; Europe.

Our only Nova Scotian collection is from LUNENBURG Co.: boggy margins of shallow pools, out'et of Hebb's Lake, Bridgewater

*B. CONNATA Muhl.; Fernald, RHODORA, x. 200 (1908). LUNENBURG Co.: wet thickets and swales back of brackish shore of Lahave River, Bridgewater first station east of southern Maine. Earlier records belong to var. *petiolata* (Nutt.) Farwell.

B. FRONDOSA L., var. ANOMALA Porter. YARMOUTH Co.: in *Zostera* litter, gravelly sea-beach, Yarmouth Bar; margin of thicket bordering cobbly beach of Parr Lake; the latter station unusual in being on a fresh-water lake, the variety usually occurring in brackish habitats.

*MEGALODONTA BECKII (Torr.) Greene. *Bidens Beckii* Torr. DIGBY Co.: deadwater of Rocky Brook north of Hasset; first station east of the Penobscot.

Chrysanthemum Leucanthemum L. The typical form of the species is apparently common at Annapolis Royal and Granville, and pre-

sumably in Annapolis Co.; the common plant generally throughout the province being var. PINNATIFIDA Lecoq. & Lamotte.

**Artemisia Pontica* L. Waste ground, Dartmouth.

PETASITES PALMATUS (Ait.) Gray. Very rare in the western counties. Seen by us only at one station in YARMOUTH Co.: sphagnous thicket, Belleville.

SENECIO AUREUS L. Very rare in the western counties; seen by us only at one station in YARMOUTH Co.: sphangous thicket, Belleville.

LACTUCA HIRSUTA Muhl. Widely dispersed but nowhere abundant in Yarmouth and Shelburne Cos.

PRENANTHES NANA (Bigel.) Torr. YARMOUTH Co.: tur'y crests and slopes f exposed headlands, Markland (Cape Forchu).

HIERACIUM PANICULATUM L. Occasional from Yarmouth Co. eastward at least to Annapolis and Lunenburg Cos.

H. **paniculatum × **scabrum**. A large colony exactly combining the characters of *H. paniculatum* and *H. scabrum* and more abundant than either of them, in dry pine and oak woods on steep slopes along Lahave River, Bridgewater, Lunenburg Co.

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I. RECORDS PRELIMINARY TO A GENERAL TREATMENT OF THE EUPATORIEAE,—III.

By B. L. Robinson

In further study of the *Compositae-Eupatorieae*, it has been possible for the writer to examine, during the last eighteen months, a large amount of highly interesting material. Much of this has been in the form of *indeterminata* of earlier collections very kindly lent for study and identification. Notable among such sendings have been the following: *a*) Two loans from the Museum of Natural History in Paris, one chiefly of Brazilian material, the other largely Mexican, the former including a remarkable series of plants collected from 1816 to 1821 by Auguste de Saint-Hilaire and containing many striking novelties. *b*) The *Eupatorieae* from the extensive Bolivian herbarium of Dr. Otto Buchtien lately acquired by the United States National Herbarium, a collection exceedingly helpful in the further interpretation of the complicated flora it represents. *c*) A loan from the Botanical Museum of the University of Zürich, including many plants of interest, notably some from the Colombian collection of Dr. Eugene Mayor and of the Bolivian collection of Dr. Th. Herzog, which had not been previously available to the writer. *d*) A large loan from the Botanical Institute and Boissier Herbarium of the University of Geneva, exceptionally rich in certain of the older collections, particularly of the Mexican and Peruvian plants of Pavon and the horticultural gatherings of Linden, Funck, and Schlim in Colombia, also containing some further numbers from the Bolivian collection of Dr. Herzog, as well as extensive and admirable Paraguayan material (still to be studied in detail). *e*) A small but interesting collection of horticultural forms of *Ageratum* sent from the United States Department of Agriculture for botanical identification. *f*) Recent loans of Mexican and Central American *innominata* from the United States National Herbarium and from the Missouri Botanical Garden. *g*) Residual portions of several older loans of similar nature from the Royal Gardens at Kew, the New York Botanical Garden, the Missouri Botanical Garden and the herbarium of the University of California, each of which has on further study yielded points of interest or novelties not previously demonstrated.

The writer has also had the privilege of lately re-examining the *Eupatorieae* in the National Herbarium and its segregated type-collection, also the unexcelled Central American herbarium of Mr. John

Donnell Smith of Baltimore. He has furthermore had opportunity to study the *Eupatoriae* secured on several expeditions recently made in the American tropics, notably the following: Mr. P. C. Standley's large collection from the Republic of Salvador and eastern Guatemala, supplemented by that of Dr. Calderón; considerable material from the more recent gatherings of Prof. H. Pittier, Dr. Alfredo Jahn, and Mr. E. H. Pittier in northern and western Venezuela; of Dr. H. A. Gleason and assistants in British Guiana; of Dr. N. L. Britton and assistants in several of the West Indian Islands; of the late Prof. E. W. D. Holway in Minas Geraës and São Paulo, Brazil; and an exceedingly interesting collection obtained by Messrs. Macbride and Featherstone on the first Peruvian Expedition of the Field Museum of Natural History.

Material from the above sources, examined in connection with the now fairly detailed and largely authenticated representation of the *Eupatorium* tribe in the Gray Herbarium, has yielded the following novelties and plants needing some revision of their classification, synonymy, or nomenclature.

Ophryosporus origanoides (Meyen & Walp.) Hieron. in Engl. Bot. Jahrb. xxii. 707 (1897). To the synonymy of this species must be added the recently published *Kanimia colombiana* Rusby, Descript. S. Am. Pl. 148 (1920). The type of the latter, kindly loaned to the writer from the New York Botanical Garden, proves to have distinctly 5-angled achenes without supplementary ribs and to have anthers destitute of the terminal appendage. Either of these characters would exclude the plant from *Kanimia*, which furthermore is a genus of normally twining habit totally unlike the upright much branched small-leaved shrub here in question. Careful dissection and comparison, detail by detail has, however, failed to disclose any significant difference separating this plant, supposedly of Colombia, from *Ophryosporus origanoides*, a species common and widespread in the Andes of Peru and Bolivia. The number of florets in the head seems to be subject to considerable variation even in the same individual, as for instance from 3 in small crowded heads to 9 in terminal or better developed ones. The number therefore is not sufficiently constant to justify its use in keying the nearly related species of *Ophryosporus*, as by the writer, Contrib. Gray Herb. lxi. 26 (1920).

It is exceedingly unfortunate that the original label of the Rusby & Pennell plant was lost. The sheet is annotated as having been found next no. 165 in the bundle, and Prof. Britton informs me that no. 165 (*Sida jamaicensis*) was collected at Girardot, Dept. Cundina-

marca. This seems to be the first record of the genus *Ophryosporus* from Colombia. It is a great pity that it does not rest upon greater certainty.

Noteworthy in this connection is a close habital resemblance between *Ophryosporus origanoides* and the still obscure *Eupatorium serratifolium* (HBK.) DC. The type of the latter species, originally described as *Mikania serratifolia* HBK., is supposed to have come from near Mariquita in the Colombian Department of Tolima. Though shown by a (very poor and partially fogged) photograph to possess in habit a remarkable similarity to *Ophryosporus origanoides*, it was described as having 6-angled and glabrous branches and glabrous involucral scales, characters which certainly do not apply to *O. origanoides*.

AGERATUM CORYMBOSUM Zuccagni, forma ALBUM Robinson, Proc. Am. Acad. xlix. 475 (1913). To the synonymy of this form may be added *Coelestina sclerophylla* Wooton & Standley, Contrib. U. S. Nat. Herb. xvi. 176 (1913). After comparing the type of this proposed species with extensive and varied material of *A. corymbosum* in the Gray Herbarium and in the United States National Herbarium, the writer can find no differences which appear to be significant.

A. HOUSTONIANUM Mill. Dict. ed. 8, no. 2 (1768). This, for horticultural purposes, the best annual species of its genus, is subject to conspicuous variation, particularly when brought under the artificial conditions of cultivation. Some of the resulting forms, such as those tending to compactness of habit, dwarf stature, etc., are pretty clearly minor strains of little importance in natural classification whatever may be their economic value in trade. However, variations involving morphological differences in parts or conspicuous distinctions of color may well be put on botanical record to secure uniformity of listing when these plants are found in the wild as escapes, ballast weeds, etc. The following forms of this species appear to comprehend those worthy of such record so far as known to date.

Var. α. **typicum**, foliis deltoideo-ovatis vix vel non longioribus quam latis basi truncatis vel cordatis; pappi squamis 5 distinctis longe aristatis.—This variety includes a great majority of the cultivated forms of the species, showing much difference in luxuriance, compactness and stature. It has also three conspicuous color-forms, as follows:

Forma a. **normale**, corollis et styli ramis coeruleis.—In horticulture this passes as "A. mexicanum," "Dwarf Blue," "Little Dorrit (blue)," etc.

Forma b. **niveum**, forma nova, corollis et styli ramis laete albis.—Cultivated as "Ageratum Dwarf White" and "Little Dorrit (white)," etc. Founded on material purchased under these names of the Joseph Breck & Sons Corporation, grown for the Department of Agriculture at Glen Echo, Maryland, and collected 13 Sept. 1922, *O. M. Freeman*, nos. 5074, 5080 (U. S., Gr.).

Forma c. **luteum**, forma nova, corollis et styli ramis pallide luteis.—Cultivated as "Ageratum nanum luteum." Founded on material supplied by the Joseph Breck & Sons Corporation and cultivated at Glen Echo for the Department of Agriculture, collected 24 Aug. 1922, *O. M. Freeman*, no. 5084 in part (U. S., Gr.).

Var. β. **angustatum**, var. nov., foliis (oppositis vel aliquando ternis) suboblongo-ovatis sesqui vel bis longioribus quam latis basi rotundatis vel obtusis vel etiam acutatis; pappi squamis distinctis longe aristatis.—Found naturalized in the Maritime Alps at Menton, France, in the spring of 1878, *Walther* (hb. Univ. Zürich, tracing and small fragm. Gr.). The flower-color appears to have been a pale pinkish blue.

Var. γ. MUTICESCENS Robinson, foliis deltoideo-ovatis; pappi squamis vel omnibus vel ex parte muticis saepius plus minusve connatis et pappum coroniformem formantibus.—Proc. Am. Acad. li. 532 (1916).—Now known in two marked color-forms, as follows:

Forma d. **isochroum**, corollis et styli ramis coeruleis.—Found in the wild at Wartenberg, near Tantoyuca, Prov. Huasteca, southern Mexico, *Ervendberg*, no. 100 (Gr.); cultivated under the names "Stella Gurney," "Cope's Pet," and "Blue Perfection."

Forma e. **versicolor**, forma nova, corollis pallide luteis; styli ramis in eodem capitulo aliis pallide luteis aliis lavandulaceo-coeruleis.—Founded on material sold by the Joseph Breck & Sons Corporation under the name "Ageratum nanum luteum" and grown at Glen Echo, Maryland, for study at the Department of Agriculture in Washington, collected 29 July, 1922, by *O. M. Freeman*, no. 5084 in part (U. S., Gr.). Color said to be creamy white. The styles are clearly variable in the same head from very pale yellow to light lavender-blue.

Material obtained from the Joseph Breck & Sons Corporation under the name "Little Blue Star" and cultivated by Mr. O. M. Freeman at Glen Echo, Maryland, proves to be *Ageratum latifolium* Cav.

Symphyopappus myricifolius, spec. nov., fruticosus glaber viscidus plus minusve vernicosus oppositirameus; caulibus 5 mm. vel

ultra diametro inferne delapsu foliorum denudatis et cicatricosis; rameis adscendentibus post exsiccationem atropurpureis angulatis superne foliosissimis; internodiis 0.5–4 cm. longis; foliis suboppositis vel distincte alternis oblanceolato-oblongis obtusis vel acutiusculis grosse serratis (basi gradatim cuneata integerrima excepta) chartaceo-subcoriaceis penniveniis utrinque minute punctatis 6–9 cm. longis 2–3 cm. latis post exsiccationem brunnescentibus; costa supra canaliculata subtus exserta; venis lateralibus utroque 4–9 prorsus vergentibus; dentibus marginis 0.5–1.5 mm. altis 6–14 mm. inter se distantibus; petiolo 1–1.8 cm. longo atropurpureo; corymbis densis leviter convexis ca. 8 cm. diametro folia vix aequantibus; pedicellis inaequalibus plerisque brevibus angulatis; capitulis ca. 1 cm. longis 2.5 mm. diametro ca. 5-floris; involucri squamis ca. 11 brunneo-stramineis 3–4-seriatim imbricatis plerisque 3-striatis, extimis lanceolatis acutis laxis, mediis et interioribus oblongis obtusis vel rotundatis apicem versus ciliolatis et granulatis; corollis 5 mm. longis tubulatis glabris, faucibus vix differentiatis; dentibus limbi anguste deltoideis 0.5 mm. longis; achaeniis glabris 5-angulatis deorsum decrescentibus 2.5 mm. longis nigrescentibus lucidulis; pappi setis ca. 35–40 basi in annulo breviter connatis et conjunctim ab achaenio deciduis ca. 4.5 mm. longis flavescenti-albis deorsum paullo incrassatis sursum barbellatis. —Brazil: Minas Geraës, *A. Saint-Hilaire* (journey of 1816–1821), Cat. D. no. 155 (Par., phot. Gr.).

This plant is certainly a *Symphyopappus* if that genus is to be maintained as distinct from *Eupatorium*. The pappus-bristles, which are somewhat firmer than is usual in *Eupatorium*, are clearly though shortly connate into a ring at the base and cohere after disarticulation from the achene. The habit of the species is much like that of *S. polystachyus*, but the leaves (recalling those of *Myrica cerifera*) are distinctly feather-veined, a character which at once distinguishes the plant from any hitherto described species of the genus.

S. pennivenius, spec. nov., ut videtur erectus herbaceus perennis 4 dm. vel ultra altus (basi ignota); caule recto ad inflorescentiam simplici foliato purpureo-brunneo primo crispe puberulo tardius glabrato ad 6 mm. diametro post exsiccationem pluricostulato; internodiis 2.5–5.5 cm. longis; foliis oppositis oblanceolato-oblongis saepe conduplicatis caudato-acuminatis basi longe cuneata integra excepta argute serratis (dentibus 0.5–1 mm. altis 2–4 mm. basi latis prorsus vergentibus) chartaceis penniveniis supra glabris subbullatis viridibus subtus multo pallidioribus in costa venisque puberulis 7–12 cm. longis 2–3.5 cm. latis; venis lateralibus principibus utroque 4–6; petiolo

brevi 2–5 mm. longo basi ampliato; corymbo terminali amplissimo trichotomo modice convexo denso usque ad 27 cm. diametro puberulo; bracteis linearibus attenuatis; capitulis numerosissimis 5-floris 7–8 mm. longis; involucri primo cylindrati mox plus minusve campanulati-patentis squamis ca. 16 caducissimis stramineis 3-nerviis apicem rotundatum versus ciliolatis 3–4-seriatim imbricatis; corollis cylindratis ca. 4.8 mm. longis vix in tubum proprium et fauces differentiatis; dentibus limbi anguste deltoideis 0.3 mm. longis; achaeniis nigris lucidis glabris 2.5 mm. longis deorsum abrupte attenuatis; pappi setis ca. 48 albidis saepe conjunctim disarticulantibus.—Brazil: Minas Geraës, *A. de Saint-Hilaire* (journey of 1816–1821), no. 743, Cat. D, no. 196 (Par., phot. Gr.).

Except for its much wider and distinctly pinnate-veined leaves this species much resembles *Eupatorium bupleurifolium* DC., a plant suspiciously near to the genus *Symphyopappus* both in technical and habital traits.

Eupatorium (§ **Subimbricata**) **arthrodes**, spec. nov., fruticosum scandens; caule tereti fistuloso 5 mm. vel ultra crassitudine flexuoso a cortice griseo tecto ad nodos transverse articulato; internodiis plerisque 1–3 cm. longis; foliis oppositis petiolatis oblongis acuminatis basi acutiusculis vel subrotundatis utroque latere obscure pauci-dentatis (dentibus 0.3–0.5 mm. altis 7–10 mm. inter se distantibus incurvis inconspicuis) unicostatis penniveniis utrinque glaberrimis post exsiccationem nigrescentibus subtus pallidioribus 7–10 cm. longis 3–4 cm. latis ut videtur carnosis; petiolo 1.7–3.5 cm. longo glabro; corymbis terminalibus modice convexis 8–17 cm. diametro crispe puberulis multicapitulatis modice densis; pedicellis 6–10 mm. longis; capitulis ca. 12-floris 1 cm. altis 5 mm. (sed post exsiccationem ca. 10 mm.) diametro; involucri squamis ca. 10 minute ciliolatis aliter glabris stramineo-brunneis striatulis apice rotundatis valde imbricatis conspicue inaequalibus; exterioribus 4–5 late ovatis 2.6–5 mm. longis 2.8–3.2 mm. latis, interioribus oblongis 6–8.5 mm. longis 1.8–2.8 mm. latis; corollis glabris tubulatis 5–5.5 mm. longis roseis; dentibus limbi ca. 0.7 mm. longis; achaeniis flavido-brunneis 4 mm. longis in angulis sursum scabratis; pappi setis ca. 40 albidis sublaevibus 6 mm. longis.—Costa Rica: a pink-flowered liana on old trees in pastures at La Palma, alt. 1550 m., 15 Aug. 1898, *A. Tonduz*, no. 12430 (U. S., Herb. Inst. phys.-geog. nat. Cost., fragm. Gr.)

This striking plant has long been doubtfully associated with *E. carnosum* O. Ktze., a species known to the writer only from a sketch and notes made during somewhat hurried examinations of

authentic material at Kew and at the New York Botanical Garden. As it seemed likely that the Tonduz plant on actual comparison might prove distinct the New York type of *E. carnosum* was borrowed and on careful examination the following differences were evident.

In *E. carnosum* the leaves are more rhombic-oblong, more acute at base, obviously thicker, and subentire; the petioles are only about 8 mm. long, thus being scarcely half the length of those in *E. arthrodes*. The heads are more numerously flowered (florets according to Kuntze 20–25). The corollas are conspicuously glandular-atomiferous about the limb while in *E. arthrodes* they appear to be quite free from such glandularity. Kuntze described his species as a shrub 3–4 m. high, while Tonduz states that his was a "liane à fleurs roses sur les vieux arbres."

These plants, now found to be clearly distinct, belong in a small group of thick-leaved lignescent species of which other members are the Mexican and Central American *E. araliaefolium* Less., the Costa Rican *E. parasiticum* Klatt, and the Colombian *E. sciaphilum* Robinson.

The name *arthrodes* alludes of course to the jointed character of the stem, the nodes showing (at least in the dried specimens) a fine sharp transverse constriction.

E. ASCENDENS Sch.-Bip. ex Bak. in Mart. Fl. Bras. vi. pt. 2, 296 (1876). Plants with habit and significant characters of this species may be varietally distinguished as follows:

Var. α. **typicum**, caule ubique breviter incurvo-puberulo et cum pilis longioribus patentibus subsetiformibus obtecto; foliis coriaceis basi abrupte contractis vel subrotundatis utrinque setosis subtus reticulatis; petiolo 2–3 mm. longo densissime setoso.—BRAZIL: Prov. Minas Geraës.

Var. β. **parcisetosum**, var. nov., paullo gracilius; caule incurvo-puberulo non setoso; foliis submembranaceis subsessilibus utrinque parce (praecipue in nervis venisque) setosis subtus conspicue punctatis; petiolo vix 1 mm. longo.—BRAZIL: Prov. Rio Grande do Sul, *A. de Saint-Hilaire*, Cat. C², no. 2761 (Par., phot. Gr.).

E. (§ **Cylindrocephala**) **austerum**, spec. nov., fruticosum validum glabrum ut videtur erectum (basi ignota) ramosum post exsiccationem nigrescens; partibus juvenilibus plus minusve viscidis et vernicosis; caule tereti griseo ad 4 mm. vel ultra diametro, internodiis 2–6 cm. longis; ramis adscendentibus subteretibus atropurpureis foliosis; foliis oppositis petiolatis ovatis acuminatis basi abruptius acutatis margine serratis (dentibus utroque latere 8–11 plerisque ca.

1 mm. altis) fere a basi 3-nerviis utrinque glabris et prominulenter reticulatis 4–7 cm. longis 1.5–4 cm. latis coriaceis saepe conduplicatis; petiolis 10–17 mm. longis supra canaliculatis, eis ejusdem jugi a linea elevata transversa connexis; corymbis terminalibus convexis 3–10 cm. vel ultra diametro 5–25-capitulatis; pedicellis 4–10 mm. longis crassis rigidis; capitulis ca. 65-floris ca. 13 mm. altis et 9 mm. diametro; involucro ovoideo-cylindrato ca. 11 mm. alto; squamis ca. 60 pluriseriatim imbricatis arcte adpressis apice obtussisimis vel rotundatis ciliolatis plerisque 3–5-nervatis apicem versus fuscescentibus dorso glabris vel obscure pulverulentis, extimis suborbiculatis ca. 3.5 mm. diametro, intermediis late ellipticis ca. 5 mm. longis et 3 mm. latis, interioribus anguste spatulatis paleiformibus; corollis lilaceis ca. 6.5 mm. longis glabris gradatim sursum paullo dilatatis sine faucibus distinctis; dentibus limbi ca. 0.6 mm. longis; achaeniis (valde immaturis) glabris 4 mm. longis; pappi setis delicatule capillaribus corollam subaequantibus.—BOLIVIA: in the bush region of Tres Cruces, alt. 1500 m., Feb. 1911 (TYPE, hb. Univ. Geneva, phot. and fragm. Gr.).

This species is nearest *E. laevigatum* Lam. but differs markedly in its relatively longer petioles, its more ovate and acuminate instead of elliptic-oblong and acute leaves, its stouter pedicels and especially its much larger more numerously flowered heads. The name has been suggested by the darkened hue and consequent gloomy appearance of the specimen.

E. baccharoides, var. **fratris.** Mr. J. C. Nelson of Salem, Oregon, has kindly called my attention to the fact that in the original publication of this variety (Contrib. Gray Herb. lxv. 47, 1922) the varietal name was through some now unaccountable clerical or typographical error given as **fratri.** The form intended was, of course, as above.

E. (§ **Eximbricata**) **Brandegeanum,** spec. nov., herbaceum et perenne vel (basi ignota) verisimiliter plus minusve fruticosum; caulibus (ramisve) gracilibus teretibus flexuosis crispe puberulis pallide viridibus 1–1.6 mm. diametro; internodiis 3–5 cm. longis; foliis oppositis petiolatis deltoideo-ovatis obtusis basi truncata vel subcordata excepta crenato-dentatis (dentibus plerisque 1–2 mm. altis et 4–6 mm. latis) membranaceis utrinque viridibus supra parce hirtis subtus praecipue in nervis venisque laxe breviterque pubescentibus a basi 3(–5)-nerviis; petiolo gracili 3–10 mm. longo supra canaliculato puberulo; corymbis trichotomis laxiusculis subfasciculatis dense glandulari-puberulis; pedicellis filiformibus flexuosis glandulari-puberulis 6–15 mm. longis; capitulis 12–18-floris ca. 8 mm. altis;

involucri squamis ca. 12 vix imbricatis lineari-lanceolatis attenuatis viridibus vel purpureo-tinctis plerisque 2-costatis dorso glandulari-puberulis; corollis albis glabris; tubo proprio 2 mm. longo; faucibus ampliatis campanulato-subcylindricis 2.5 mm. longis; dentibus limbi deltoideis 1 mm. longis; achaeniis 3–3.5 mm. longis brunneis sursum hispidulis; pappi setis ca. 20 tenuibus albis.—MEXICO: State of San Luis Potosi: at Minas de San Rafael, Nov. 1910, *Dr. C. A. Purpus*, no. 4822 (hb. Univ. of Calif. phot. and fragm. Gr.).

This well marked species is perhaps most nearly related to the little known *E. hederaefolium* Gray, which however has reniform-ovate decidedly cordate leaves, more compact inflorescence, and shorter considerably less attenuate involucral scales which are dorsally tomentellous and not as here glandular-puberulent. From *E. petiolare* Moc. the present species differs considerably in the smaller size and much less cordate shape of the leaves, much shorter petioles, looser inflorescence, and fewer-flowered heads, as well as in its much more slender habit.

It is a pleasure to dedicate this attractive species to Mr. T. S. Brandegee, who in addition to many other botanical activities has long cared for the identification and distribution of the highly interesting series of Mexican plants secured by Dr. Purpus.

E. (§ EXIMBRICATA) CALAMINTHAEFOLIUM HBK., Nov. Gen. et Spec. iv. 129, t. 348 (1820). This characteristic species, frequent from Coahuila to southern central Mexico, shows considerable variability in the size and form of the leaves. It also varies much in the length and density of the pubescence. The historical type was characterized as being pulverulent-pubescent, and it is true that in the greater part of the material available the hairs are very short, obscure, and scattered. The following variety may be readily distinguished:

Var. **irrasum**, var. nov., ramis dense patenter pubescentibus; foliis conspicuiter bicoloribus supra dense puberulis viridibus subtus multo pallidioribus griseo-tomentellis; aliter var. typicam simile.—MEXICO: in fields, alt. ca. 2135 m., in the Cordillera, Oaxaca, *H. Galeotti*, no. 2022 (TYPE in the Natural History Museum at Paris, phot. Gr.); Esperanza, Puebla, *Dr. C. A. Purpus*, no. 2457 (Gr.).

The leaves in the specimen of Dr. Purpus are very small in the manner of the north Mexican *E. Wrightii* Gray, but they are exclusively secondary rameal leaves characteristic of the renewal of vegetative conditions after drought.

E. (§ **Praxelis**) **chiquitense**, spec. nov., humile herbaceum perenne ca. 1.5 dm. altum; radice (vel caudice) lignescente usque ad 5 mm.

crassa a cortice griseo rimoso obtecta; caule brevi plus minusve decumbente 1–3 mm. crasso glaberrimo primo folioso mox per delapsum foliorum denudato pallide brunneo; internodiis 3–5 mm. longis; ramis adscendentibus teretibus costulato-striatis foliosissimis; foliis oppositis anguste linearibus sessilibus integerrimis paullulo carnosulis supra glaberrimis longitudinaliter ruguloso-plicatulis subtus inter costam et marginem paullo furfuraceo-arachnoideis obscure 3-nerviis 1.5–2 cm. longis 0.5–0.9 mm. latis utroque subattenuatis post exsiccationem nigrescentibus; corymbis pauci-capitulatis laxis; pedicellis 8–20 mm. longis glabris; capitulis ca. 25-floris saepe nutantibus; involucro albido-stramineo 8 mm. longo 4 mm. diametro pluriseriatim imbricato glaberrimo; squamis gradatis pallidis plerisque 3-striatis, exterioribus lanceolatis attenuatis, interioribus lineari-oblongis acutis; receptaculo conico glabro; flosculis valde immaturis; pappi setis albidis scabratis.—Bolivia: Dept. Santa Cruz: Prov. Chiquitos; on rocks of the Cerro Pesenema near Santiago de Chiquitos, alt. 800 m., May, 1907, *Th. Herzog*, no. 25 (herb. Univ. of Zürich., phot. and single leaf Gr.)

Habitally near the Brazilian *E. sanctopaulense* Robinson described below, but of much lower stature, more densely leafy, and with pale acute involucral scales.

E. (§ Eximbricata) conspicuum Kunth & Bouché, Ind. Sem. Hort. Berol. 1847, p. 13 (1847). Two varieties of this species may be distinguished as follows:

Var. **typicum**, caule ramisque plus minusve flexuosis sulcatis et conspicue hexagonis; acumine basali foliorum serrato.—*E. grandifolium* Regel, Gartenfl. i. 102, t. 12 (1852); *Kyrstenia grandifolia* (Regel) Greene, Leafl. i. 9 (1903).—Mexico: Oaxaca, on the Sierra de San Felipe, alt. 1800 m., *Conzatti*, no. 121 (Gr.); Morelos, on lava fields above Cuernavaca, alt. 2440 m., *Pringle*, no. 8050 (Gr.). Cultivated material from original stock raised at the Berlin Botanical Garden in 1847 (Gr.).

Var. **pueblense**, var. nov., ut videtur erectum; caule ramisque rectis teretibus nec angulatis nec sulcatis; acumine basali foliorum integro.—Mexico: State of Puebla, on rocky slopes, Boca del Monte, Mar. 1908, *Dr. C. A. Purpus*, no. 2992 in chief part (hb. Univ. Calif., phot. & fragm. Gr.). With this plant there has been associated on the sheet in the herbarium of the University of California a small branch of what appears to be *E. Aschenborniamum* Schauer.

E. (§ **Subimbracata**) **costatipes**, spec. nov., herbaceum perenne basi paullulo lignescente ramosum; caulibus paucis gracillimis flexu-

osis suberectis 2–3.3 dm. altis brevissime tomentellis obscure costulatis ad mediam partem foliosis superne nudis; foliis oppositis ovatis breviter petiolatis apice rotundatis crenato-serratis sed basin rotundato-subcuneatam versus integerrimis (serraturis utroque 3–7 ca. 1 mm. altis 2–5 basi latis) coriaceis utrinque pulchre reticulato-venosissimis obscure brevissimeque puberulis supra laete viridibus subtus vix pallidioribus a petiolo 5–7-nervatis, maximis 4–4.7 cm. longis 2–2.4 cm. latis; petiolo 2–3 mm. longo dorsaliter costato; pedunculo terminali simplici vel subsimplici ca. 12 cm. longo; bracteis 1–3 subulatis; corymbo denso rotundato 2–3 cm. diametro; capitulis plerisque sessilibus 4–5-floris ca. 6.5 mm. longis ca. 3 mm. diametro; involucri squamis ca. 8 ovatis subacutis 2(–3)-seriatis tenuibus vix nervatis hispidulis apicem versus cum glandulis sessilibus aureis ornatis; corollis 3.5 mm. longis glanduliferis vix in tubum et fauces differentiatis; dentibus limbi 0.6 mm. longis deltoideis; achaeniis (valde immaturis) 2.2 mm. longis in costis hispidulis et in intervallis cum glandulis sessilibus aureis ornatis; pappi setis ca. 45 sursum barbulatis. —Brazil: Minas Geraës, *A. de Saint-Hilaire* (journey of 1816–1821), **no. 826, Cat. C[1], no. 424 (Par., phot. Gr.).**

An attractive little species with habit, foliage, long naked peduncles and closely grouped small heads much as in the Paraguayan *E. maracayuense* Chod., but very different as to involucre and many of the finer details. The ribs of the leaves are curiously continued downward to the base of the short petiole, which is presumably a contracted part of the lamina of what was once a sessile leaf.

E. (§ **Campuloclinium**) **Debeauxii**, spec. nov., ut videtur herbaceum vel paullo lignescens; caule fistuloso et ramis teretibus leviter costulatis primo aspectu glabriusculis sed vero obscure brevissimeque ferrugineo-tomentellis vel -puberulis; internodiis 2–6 cm. longis; foliis oppositis petiolatis ovatis subacutis integerrimis vel obsolete undulato-subcrenatis basi deltoideo-cuneatis papyraceis 3.5–7 cm. longis 1.5–3.5 cm. latis a puncto 4–14 mm. supra basin 3-nervatis supra viridibus puberulo-strigillosis subtus paullo pallidioribus plerumque in nervis venisque puberulis et cum glandulis sessilibus instructis; petiolo gracili sub lente brunneo-tomentello 5–12 mm. longo; corymbis terminalibus 3–8 cm. latis modice rotundatis vel planiusculis; bracteolis ligulatis; pedicellis plerisque 2–5 mm. longis; capitulis ca. 60-floris 1 cm. altis et crassis; involucri campanulato-turbinati squamis ca. 20 subaequilongis (6–7 mm. longitudine), extimis oblongis obtusis ca. 2 mm. latis extus puberulis, intermediis obovatis obtusis usque ad 2.6 mm. latis, interioribus lanceolato-

oblongis ad 1.6 mm. latis acutiusculis, intimis linearibus acutis; receptaculo conico ca. 2.6 mm. diametro ca. 1.5 mm. alto; corollis gracilibus 5.5 mm. longis glabris sursum gradatim paullo ampliatis sine faucibus distinctis; dentibus limbi ovato-deltoideis 0.5 mm. longis; antheris basi rotundatis apice cum appendice ovato-oblonga diaphana instructis; achaeniis immaturis 2.5 mm. longis apicem versus granulatis et paullo hispidulis aliter glabris; pappi setis ca. 42 albidis laeviusculis corollam subaequantibus.—BRAZIL: Santos, 23 July, 1898, *Marcel Debeaux*, no. 74 (Par., phot. Gr.).

On account of its elevated disk and the nature of its involucre this plant should certainly be referred to § *Campuloclinium*. Among the species of this section it approaches most nearly to *E. purpurascens* Bak. and *E. Glaziovii* Bak. Both these species, however, have incisely crenate leaves of somewhat different form and texture. They also have heads only about 25–40-flowered. In habit *E. Debeauxii* bears considerable resemblance to *E. Lundianum* DC. and *E. Schlechtendalii* DC. Both of these, however, have smaller, about 20-flowered heads, much more pubescent leaves, denser inflorescence, and more distinctly ribbed involucral scales.

E. (§ **Cylindrocephala**) **desmocephalum**, spec. nov., ut videtur herbaceum perenne decumbens 3–4 dm. vel ultra longum; caule vix 2 mm. crasso tereti griseo puberulo pauce ramoso folioso; internodiis plerisque 1–3 cm. longis, 1–2 penultimis usque ad 5–6 cm. longis; foliis oppositis lanceolatis utroque acutis integerrimis vel obscure et plerumque solum uno latere 1–2-crenato-dentatis a basi vel paullo supra basin 3-nerviis 1.4–3 cm. longis 3–8 mm. latis crassiusculis subcoriaceis utrinque griseo-puberulis subtus vix pallidioribus punctatis; petiolo 2–5 mm. longo; corymbis immaturis terminalibus subglobosis densis; capitulis ca. 10-floris subsessilibus ca. 8 mm. longis (valde immaturis) et 3.5 mm. diametro; involucri cylindrati squamis ca. 20 subquadri- vel quinque-seriatis obtusis squarrosis, appendice pubescenti viridi cum globulis aureis sessilibus dorso ornatis; corollis (valde immaturis) ca. 4 mm. longis roseo-lilaceis in dentibus extus globulis aurantiacis instructis; achaeniis hirtellis etiam aureo-atomiferis; pappi setis ca. 50 albis.—BOLIVIA: on rocky slopes of the Cuesta de Guayabillas, alt. 1200 m., March, 1911, *Th. Herzog*, no. 1739 (TYPE, hb. Univ. Geneva, phot. and fragm. Gr.). Obviously related to *E. rhinanthaceum*, var. *latisquamulosum* Hieron. in Engl. Bot. Jahrb. xxii. 759 (1897). However, the leaves of the present plant are less than half as wide as those described by Hieronymus and clearly shown upon his type (Brl., phot. Gr.). Furthermore, it is exceedingly

hard to believe that Herzog's Bolivian plant can be placed appropriately as a variety of the Brazilian *E. rhinanthaceum* DC. for De Candolle described his species as glabrous and nigrescent, with impunctate leaves of larger size. The leaves in *E. desmocephalum* are conspicuously dark-punctate on the lower surface, and the whole plant is thinly but very evidently cinereous-puberulent. A tracing (Gr.) of the fragmentary type of *E. rhinanthaceum* DC. in the De-Candollean herbarium now at the Botanical Garden of Geneva and a photograph (Gr.) of the type of var. *latisquamulosum* Hieron. at Berlin show the leaves in both cases more obviously crenate-dentate and less acute than in the Bolivian plant.

E. (§ **Eximbricata**) **enixum**, spec. nov., herbaceum perenne erectum fere ad apicem foliosum inconspicuiter puberulum habitu *Asterem lateriflorum* simulans 4 dm. vel ultra altitudine; caule tereti brunneo laevi superne ramoso; internodiis usque ad 7 cm. longis; foliis oppositis ad anthesin plerumque rameis lanceolatis attenuatis basi subrotundatis lateraliter pauciserratis membranaceis a basi 3(–5)-nervatis supra viridibus parce in superficie incurvo-strigillosis subtus paullo pallidioribus solum in nervis obscure puberulis 3–4.3 cm. longis 8–14 mm. latis; petiolo gracili tenuiter pubescente; capitulis ca. 22-floris ca. 7 mm. altis et crassis ramorum apices versus aggregatis conjunctim inflorescentiam pyramidatam formantibus; pedicellis gracilibus 3–5 mm. longis; involucri squamis ca. 12 subaequilongis tenuibus, extimis lanceolato-linearibus attenuatis dorso tomentellis vix costulatis ca. 4.6 mm. longis et 0.8 mm. latis, interioribus anguste oblongis acutis apicem versus ciliato-erosis dorso valde 2–3-costulatis pubescentibus ca. 5.7 mm. longis ca. 1.4 mm. latis; corollis albis limbum versus hispidulis; tubo proprio gracili 2 mm. longo; faucibus ampliatis cylindricis ca. 2 mm. longis, dentibus limbi 5 deltoideis ca. 0.6 mm. longis; achaeniis brunneis (immaturis) 2–2.2 mm. longis deorsum decrescentibus in angulis hispidis; pappi setis 14–19 albis tenuissimis.—MEXICO: State of Vera Cruz: Mt. Orizaba at an altitude of about 3355 m. (11,000 ft.), Feb. 27, 1892, *Jared G. Smith*, no. 477 (TYPE in hb. Mo. Bot. Gard., Gr.); Chalchicomula, Feb. 27, 1892, *Jared G. Smith*, no. 480 (Mo.).

This narrow-leaved species with somewhat pyramidal leafy panicle suggests in dried specimens one of the small-flowered asters. It also bears some resemblance to *E. pauperculum* Gray which, however, has more corymbose inflorescence of smaller heads with narrower more attenuate involucral scales. The name selected alludes, of course, to the considerable altitude to which this plant of mesophytic habit has ascended.

E. (§ **Eximbricata**) **euphyes**, spec. nov., fruticosum robustum 3–5 m. altum; caulibus teretibus medullosis brunneo-tomentosis ad 5 mm. vel ultra crassis; internodiis 4–7.5 cm. longis; foliis oppositis petiolatis oblongis apice attenuatis basi rotundatis vel leviter cordatis utroque latere serratis (dentibus ca. 1 mm. altis et 3 mm. latis) supra pubescentibus subtus griseo- vel fulvido-tomentosis 8–12 cm. longis 3–6.5 cm. latis penniveniis; petiolo robusto flexuoso tomentoso 1–2 cm. longo; corymbis terminalibus amplis rotundatis ca. 1 dm. diametro modice densis; pedicellis 6–15 mm. longis flexuosis; capitulis magnis speciosis ca. 15 mm. altis et crassis ca. 80-floris; involucri campanulati squamis ca. 40 lanceolatis attenuatis dorso tomentellis, extimis ca. 5 mm. longis et 1.4 mm. latis, intermediis ca. 6.5 mm. longis et 1.7 mm. latis, intimis ca. 8 mm. longis et 1.3 mm. latis; corollis purpureis glabris, tubo sine faucibus distinctis a basi ad limbum gradatim ampliato ca. 9 mm. longo; dentibus limbi 5 deltoideis ca. 0.7 mm. longis; achaeniis (immaturis) ca. 3 mm. longis apicem versus paullo hispidulis basi calcaratis; pappi setis ca. 50 laete albis sublaevibus; receptaculo leviter convexo glabro.—Bolivia: Andean region, Unduavi, Nor Yungas, alt. 3300 m., Nov. 1910, *Dr. Otto Buchtien*, no. 3029 (U. S., Gr.).

This species in foliage somewhat resembles *E. endytum* Robinson, but its heads are much larger, the inflorescence looser and the corollas much more deeply colored. The plant must be a conspicuous one in nature from its grayish velvety leaves and great corymbs of bright purple flowers. In its involucre it is somewhat transitional between §§ *Eximbricata* and *Subimbricata*, the scales though not very unequal being rather numerous and fairly well imbricated toward the base.

E. (§ **Eximbricata**) **Funckii**, spec. nov., fruticulum pluricaule 2–3 dm. altum subglabrum; caudice lignescente; caulibus floriferis erectis vel curvato-adscendentibus ca. 2 mm. diametro purpureo-brunnescentibus post exsiccationem rugulosis juventate hexagonis foliosis; internodiis ca. 1 cm. longis; foliis oppositis copiose in axillis proliferis petiolatis lanceolato-oblongis apice rotundatis basi acutis margine utroque latere 2–6-serrato-dentatis a basi trinerviis utrinque glabris membranaceis, caulinis 1.5–2.5 cm. longis 5–7 mm. latis, eis ex axillis orientibus 1–1.5 cm. longis 3–4 mm. latis; corymbis terminalibus valde convexis ca. 8–12-capitulatis in ramulis pedicellisque paullo hirtellis; pedicellis ca. 4 mm. longis gracilibus; capitulis ca. 80-floris 9–12 mm. altis 10–14 mm. diametro; involucri squamis oblongis acutis tenuibus viridescenti-subscareis basin versus plerumque 2-costulatis dorso glabris vel parcissime hirtellis ca. 9 mm. longis

et 1.5–2 mm. latis, plerisque subaequalibus sed 1–3 extimis brevioribus; corollis albis ca. 4.5 mm. longis tubo proprio gracili glabro ca. 2–2.5 mm. longo; faucibus turbinato-subcylindricis ca. 3 mm. longis; dentibus limbi anguste deltoideis 1 mm. longis; achaeniis gracilibus nigris 3 mm. longis obscure paullulo scabratis basi pallide calcaratis apice a cupula pappifera coronatis; pappi setis tenuibus corollam subaequantibus caducissimis.—COLOMBIA: an undershrub with white flowers in the Sierra Nevada, Prov. Santa Marta, alt. 2135 m.; 1843, *Funck*, no. 473 (TYPE, hb. Univ. Geneva, phot. and small fragm. Gr.).

This species differs much from any previously attributed to Colombia. It somewhat resembles, however, the Bolivian and Peruvian alpine species *E. scopulorum* Wedd., but the latter has larger ovate leaves rounded at the base and somewhat pubescent while its involucral scales are for the most part narrower more acute and clearly gland-sprinkled. Furthermore in *E. scopulorum*, the young stems and branches are terete and covered with a fine puberulence, which persists nearly or quite to the woody part, but in *E. Funckii* the young stems and branches are decidedly hexagonal and much more sparingly and fleetingly clothed with an obscure puberulence.

E. (§ **Subimbricata**) **Galeottii**, spec. nov., herbaceum perenne (Galeotti) vel fruticosum glabriusculum usque ad 4–6 m. altum (Linden) foliis inflorescentiaque *E. Pittieri* simillimum; caule verisimiliter erecto et plus minusve lignescente juventate hexagono purpurascente obscure puberulo aetate subtereti glabriusculo cortice griseo obtecto; internodiis superioribus usque ad 8 dm. longis, inferioribus multo brevioribus; foliis oppositis magnis petiolatis oblongis acuminatis basi acuminato-cuneatis lateraliter grosse vel obscure serratis penniveniis subcoriaceis opacis utrinque viridibus et prominulenti-reticulatis solum in costa et in venis primariis obscure puberulis 11–17 cm. longis 4.5–6.5 cm. latis; petiolo 1.7–2.8 cm. longo gracili plerumque purpureo; panicula terminali ad maturitatem ampla remote et divaricatim oppositiramea usque ad 19 cm. alta et 17 cm. crassa adpresse puberula; bracteis parvis spatulatis; rhachi sub nodis compressa; pedicellis gracilibus 2–4 mm. longis; bracteolis linearisubulatis; involucri squamis ca. 13 valde inaequilongis ca. 3–4-seriatim imbricatis omnibus plus minusve acutatis, exterioribus deltoideo-ovatis ca. 2 mm. longis et 1.5 mm. latis puberulis costulatis, interioribus oblongis ca. 5 mm. longis et 1.3 mm. latis, intimis 1–2 linearibus; corollis tubulatis sursum paullo ampliatis sine faucibus distinctis ca. 3 mm. longis glabris; dentibus limbi brevibus; styli ramis ad apicem abrupte incrassatis more *Ophryospori* sed antheris

apice distincte quamquam breviter appendiculatis; achaeniis ca. 2 mm. longis pallidis granulatis; pappi setis ca. 32.—MEXICO: in damp thick woods on the Cordillera, State of Vera Cruz, alt. about 915 m. (3000 ft.), Mar. 1840, *H. Galeotti*, no. 2337 (TYPE K., Par., phot. Gr.); in the State of Vera Cruz, Feb. 1839, *J. Linden*, no. 1225 (K., Univ. Geneva); Valley of Cordova, Apr. 2, 1866, *Bourgeau*, no. 2204 (K.). Galeotti states that the flowers are fragrant and greenish ("verdâtres"), while Linden's note calls them "d'un jaune verdâtre."

This species in foliage, inflorescence and many details is strikingly similar to the Central American *E. Pittieri* Klatt, but that has the involucral scales all rounded, not pointed, at the tip and they are by no means so different in length as in *E. Galeottii*. Pittier, collecting *E. Pittieri* in Costa Rica, called it on his label an "arbre" and von Tuerckheim, securing it some years later in Guatemala, calls it a "Baum." On the other hand Galeotti notes his plant with the sign ♃ traditionally employed to indicate a perennial herb, and in fact specimens of the Mexican plant, though none show the base, appear less inclined to lignescence. It is possible that these nearly related species will ultimately show transition, but so far as our knowledge goes they are consistently different in their involucres and must for the present be treated as independent species, especially as they have distinct ranges which do not overlap.

E. (§ CYLINDROCEPHALA) GLABERRIMUM DC. Prod. v. 144 (1836). This species, based upon one of Haenke's plants, supposed to have come from Mexico, but without more precise data, was described as glabrous throughout and as having leaves two inches wide. On finding in the collection of Langlassé in 1905 a plant with conspicuously pubescent stem and inflorescence and with decidedly narrower leaves, the writer described it as *E. Michelianum* (Proc. Am. Acad. xli. 276), believing it to be specifically distinct, but at the time calling attention to its close relationship to the still obscure *E. glaberrimum*. Recent opportunity to examine further material of Langlassé's no. 589, on which *E. Michelianum* was based, shows such variability in its leaf-breadth and in the degree of its pubescence as to lessen considerably the diagnostic value of these characters and it now seems probable that *E. Michelianum* is more appropriately ranked merely as a narrow-leaved and pubescent variety of the earlier and little known species, thus:

E. GLABERRIMUM DC., var. **Michelianum** (Robinson), comb. nov. *E. Michelianum* Robinson, Proc. Am. Acad. xli. 276 (1905).

E. (§ **Cylindrocephala**) **Herzogii**, spec. nov., ut videtur herbaceum perenne erectum; basi ignota; caule (ramove) tereti post exsiccationem obscure costulato brunneo ca. 3 mm. crasso superne griseo-puberulo mox subglabro; internodiis ca. 5 cm. longis; foliis oppositis petiolatis membranaceis anguste ovatis gradatim acuminatis basi primo rotundatis sed deinde ad petiolum abruptius acuminatis ca. 5 cm. longis ca. 2 cm. latis apice basique integris margine lateraliter serratis a puncto ca. 5 mm. super basi 3-nerviis supra minute villosulis subtus multo pallidioribus molliter griseo-tomentosis; corymbo composito modice convexo densiusculo multicapitulato ca. 8 cm. diametro griseo-puberulo cum partialibus minoribus lateralibus; pedicellis filiformibus 3–6 mm. longis; capitulis ca. 20-floris erectis vel adscendentibus ca. 9 mm. longis ca. 5 mm. diametro; involucri cylindrati 6.5 mm. longi 4 mm. crassi squamis 5-seriatim imbricatis ca. 24 eroso-ciliatis arcte appressis, exterioribus ovatis dorso paullo infra apicem rotundatum subherbaceis et puberulis, intermediis oblongis obtusis gradatim elongatis albidis conspicue 3-nervatis dorso subglabris, intimis oblongo-linearibus acutiusculis uninervatis et apicem versus paullulo carinatis; corollis laete lilaceis gracilibus glabris 5 mm. longis; tubo proprio (ca. 1.5 mm. longo) gradatim in fauces graciles cylindratas 3 mm. longas paullo ampliato; dentibus limbi 0.5 mm. longis; achaeniis (immaturis) 2.5 mm. longis deorsum attenuatis in costis sursum scabratis; pappi setis ca. 30 albidis capillaribus sublaevibus. —Bolivia: common on mountain meadows near Samaipata, Dec. 1907, *Th. Herzog*, no. 694 (hb. Univ. Zürich, phot. and small fragm. Gr.).

This plant is clearly distinct from any included by the author in his recent revision of the Eupatoriums of Bolivia. It approaches most nearly the Colombian *E. tacotanum* Klatt, var. *trineurolepis* Robinson, but that has somewhat more slender heads with narrower and less rounded involucral scales, as well as obtuser and more oblong-ovate rugose crenate leaves. *E. Herzogii* somewhat resembles the Paraguayan *E. conyzoides*, subsp. *magaritense* Hassl. but that has slightly larger 12–14-flowered heads and broader involucral scales, even the innermost being 3-nerved.

E. (§ **Cylindrocephala**) **Hilarii**, spec. nov., fruticosum oppositirameum; caule ramisque post exsiccationem plus minusve angulato-costatis medullosis ferrugineo-tomentellis vel -puberulis, pilis brevibus curvatis; internodiis plerisque 2–5 cm. longis; foliis oppositis petiolatis ovatis acuminatis basi subacuta integerrima excepta serratis vel rarius crenatis (dentibus utroque 8–17 saepius 0.4–1 mm. altis 2–4

mm. inter se distantibus) penniveniis firmiusculo-membranaceis supra viridibus glaberrimis lucidulis rugulosis subtus multo pallidioribus reticulato-venulosis punctatis secus costam et venas plus minusve ferrugineo-lanulosis, maximis 6–7 cm. longis 3–4 cm. latis; petiolo 7–11 mm. longo crispe puberulo; corymbis ramos terminantibus densis valde convexis 4–7 cm. diametro; capitulis 5-floris 1 cm. longis subsessilibus vel breviter pedicellatis; involucri cylindrati squamis ca. 20 obtusis, extimis brevibus ovatis brunneis paullo pilosis, interioribus (caducissimis) gradatim longioribus stramineis vel brunneo-tinctis striatis oblongis apicem rotundatum versus ciliatis; corollis ca. 5 mm. longis; tubo proprio ab faucibus vix distinguendo; dentibus limbi lanceolato-oblongis 0.7 mm. longis; achaeniis atrobrunneis 3.8 mm. longis gracilibus granuliferis basin versus attenuatis; pappi setis ca. 36 paullulo rigidiusculis flavescentibus sursum minute barbellatis attenuatis.—Brazil: Minas Geraës, *A. de Saint-Hilaire* (journey of 1816–1821), no. 744, Cat. D, no. 161 (type, Par., phot. Gr.); also Cat. C², no. 60 (Par., phot. Gr.).

This species is obviously related to *E. roseum* Gardn., which, however, has oblong much shorter-petioled leaves and shorter, thicker, and smoother achenes, as well as other differences. *E. Hilarii* is likewise near *E. caaguazense* Hieron., but that is said to have cordate leaves (at most 3 cm. long and 2 cm. wide) and acute inner involucral scales. In naming this plant for its distinguished collector, it has seemed best to follow the example of such masters of New Latin as DeCandolle, Bentham, and Baillon in selecting *Hilarii* as the simplified genitive.

E. (§ **Subimbricata**) **imitans**, spec. nov., herbaceum perenne erectum laxe ramosum gracile puberulum 6 dm. vel ultra altitudine; caule tereti 2–3 mm. diametro juventate griseo-puberulo vel subtomentello aetate subglabrato; internodiis 3–6 cm. longis; foliis oppositis petiolatis saepe in axillis proliferis anguste ovatis vel rhombeo-lanceolatis utroque acutis apicem basinque versus integerrimis utroque latere argute 2–5-serratis utrinque viridibus puberulis ima a basi 3-nervatis 2.5–4.5 cm. longis 8–12 mm. latis membranaceis; petiolo 7–12 mm. longo gracili; inflorescentia terminali pyramidali foliosa laxe ramosa; ramis oppositis vel supra alternis adscendentibus apice corymbiferis; corymbis partialibus 2–4 cm. diametro plerisque 3–9-capituliferis; capitulis 49–53-floris ca. 6 mm. altis et crassis; involucri 3–5-seriati campanulati squamis ca. 27 lanceolatis viridibus acutis plerisque 2-costulatis dorso puberulis; corollis limbum versus laete purpureis hispidulis; tubo albido gradatim sursum ampliato sine

faucibus distinctis 2.6–3 mm. longo glabro; dentibus limbi ca. 0.5 mm. longis; antheris apice bene appendiculatis; achaeniis nigris 1.3 mm. longis basi pallide calcaratis in angulis sursum minute hispidulis; pappi setis 14–17 capillaribus albis.—GUATEMALA: Santa Rosa, Dept. Santa Rosa, alt. 915 m., Dec. 1892, *Heyde & Lux* (series of J. D. Smith) 4194 (TYPE, Gr.); basin of ravine, Fiscal, alt. 1130 m., 21 June, 1909, *C. C. Deam*, no. 6168A (Gr.). SALVADOR: Cerro de la Olla, 1922, *Dr. S. Calderón*, no. 993 (U. S., Gr.).

This species stands close to the Costa Rican *E. sideritidis* Benth., but that has much narrower linear-lanceolate, much more shortly petioled, indeed subsessile leaves, and smaller only 20–25-flowered heads. *E. imitans* shares almost to the point of identity the habit, inflorescence, and involucral traits of *Fleischmannia arguta* (HBK.) Robinson, but the latter has nearly twice as many florets in each head and of course has in the manner of its genus only 5 pappus-bristles definitely disposed at the angles of the achene, while in *E. imitans* the bristles are indefinite and from about 14 to 17 in number. The material collected in Salvador by Dr. Calderón, while clearly conspecific with the Guatemalan specimens, is somewhat smoother and has slightly firmer leaves.

E. (§ **Eximbricata**) **lasium**, spec. nov., herbaceum perenne erectum 5–6 dm. vel ultra altum; radice e fibris 6–12 atrogriseis simplicibus ca. 2 mm. crassis composita; caule tereti basin versus ca. 5 mm. crasso densissime sordideque patentim hirsuto ad inflorescentiam foliato; foliis oppositis longe petiolatis ovatis leviter cordatis breviter acuminatis grosse obtuseque dentatis (dentibus 1–3 mm. altis 2–4 mm. latis) utrinque laxe hirsutis (pilis albis crispis articulatis) ut videtur textura carnosulis tamen membranaceis 3–7 cm. longis 2.7–6 cm. latis paullo supra basin 3(–7)-nervatis; petiolis inferioribus usque ad 5 cm. longis; inflorescentia laxe paniculata; bracteis foliaceis sed multo reductis; pedicellis plerisque 5–18 mm. longis; capitulis ca. 8 mm. altis et crassis ca. 60-floris; involucri squamis ca. 15 oblongis subaequalibus obtusis ca. 5.5 mm. longis et 1.4 mm. latis apicem versus longe ciliatis; corollis albis in limbo hispidulis; tubo proprio ca. 1.7 mm. longo; faucibus ampliatis cylindratis ca. 2 mm. longis; dentibus limbi deltoideis ca. 0.8 mm. longis; achaeniis nigris ca. 1.8 mm. longis in costis sursum minute scabratis; pappi setis ca. 20 tenuissimis albis caducis ca. 3.5 mm. longis.—MEXICO: State of Michoacan, near la Huerta in the vicinity of Morelia, alt. 1950 m., 1 Sep. 1910, *Bro. Arsène*, nos. 5788 (TYPE in Gray Herb., U. S.), 5440 (Gr., U. S.); also at Loma Santa Maria, alt. 1950 m., likewise

in the vicinity of Morelia, 28 Oct. 1910, *Bro. Arsène*, no. 5867 (Gr., U. S.).

This beautifully distinct species belongs in a small group striking by reason of their loose inflorescence. They may be keyed as follows:

Leaves ovate-oblong to elliptic-suborbicular, acutish to obtusely pointed at base, confined to the lowest third of the stem.
Involucral scales broadly oblong, rounded at apex.....*E. Muelleri.*
Involucral scales linear-lanceolate, acute.....*E. bellidifolium.*
Leaves ovate, broadly cordate: stem leafy up to or often into the inflorescence.
Leaves 3-nerved from the very base, green and sparingly pubescent on both surfaces; involucral scales lance-oblong to linear-lanceolate, acute, about 0.5 mm. wide.....*E. choricephalum.*
Leaves 3–5(–7)-nerved from slightly above the base, hirsute on both surfaces; involucral scales broadly oblong, obtuse, about 1.4 mm. wide.....*E. lasium.*

Members of this group have been already discussed in Proc. Am. Acad. xlix. 433, 434, and liv. 239, 240.

E. (§ **Subimbricata**) **leucomyelum**, spec. nov., habitu *E. popayanense* valde simulans; basi ignota; caule (ramove) curvato adscendente subtereti crassiusculo ad 6 mm. diametro pallide brunneo laxe setoso-piloso usque ad inflorescentiam folioso post exsiccationem longitudinaliter ruguloso; internodiis ca. 3 cm. longis; foliis oppositis lanceolato-oblongis utroque acuminatis basi gradatim cuneata integerrimis aliter margine serrato-dentatis (dentibus utroque ca. 30 plerisque 0.6–0.9 mm. altis 3–4 mm. latis cuspidatis) firmiter membranaceis 11–15 cm. longis 3–5 cm. latis penniveniis supra atroviridibus subglabris (costa media basin versus latiuscula canaliculata flavescente) subtus praecipue in costa venisque setoso-pilosis; petiolo ca. 6 mm. longo cum setis moniliforme articulatis piloso; corymbo composito piloso modice convexo ca. 1.5 dm. diametro multicapitulato; capitulis ca. 9–10-floris ca. 7.5 mm. altis; pedicellis 0.5–4 mm. longis; involucri squamis ca. 10 ca. 3-seriatim imbricatis valde inaequalibus, intermediis maximis ovatis ca. 4 mm. longis et 1.7 mm. latis obtusis apicem versus eroso-ciliolatis medio plus minusve incrassatis viridibus vel purpurascentibus marginem versus tenuioribus stramineis, intimis 1–3 linearibus vix 0.5 mm. latis; corollis albis glabris 4 mm. longis; tubo proprio 1.5 mm. longo; faucibus ampliatis ca. 2.5 mm. altis; dentibus limbi ovatis 0.6 mm. longis; achaeniis (vix maturis) pallide brunneis ca. 1.8 mm. longis deorsum decrescentibus in costis sursum hispidulis; pappi setis ca. 23–25 inaequalibus albis.—VENEZUELA: State of Mérida: Páramo de Timotes and La Venta, alt. 2800 m., 21 Jan. 1922, *Dr. Alfredo Jahn*, no. 829 (U. S., Gr.).

This plant in the form and disposition of its leaves immediately recalls *E. popayanense* Hieron. and indeed appears to be rather closely related to that species. However, *E. popayanense* is a much smoother plant without the setose pilosity here readily discernible on stem, petioles and lower surface of leaves. Furthermore, *E. popayanense* has longer-pedicelled about 20-flowered heads with larger more numerous and 3-nerved involucral scales. Its slightly larger corollas are said to be beset on the tube with sessile glands not found in the case of *E. leucomyelum*. Though the leaves of *E. leucomyelum* in form somewhat resemble those of Mexican and West Indian species of the *Critonia* series they show no pellucid dot-and-dash punctation.

E. (§ **Subimbricata-Eximbricata**) **Macbridei**, spec. nov., arboreum pluricaule usque ad 12 m. altum; caulibus firmiter ligneis ad 1 dm. diametro cum cortice rimoso griseo obtectis solum apicem versus ramosis; ramis juventate aliquid sexangulatis mox teretibus; internodiis 2–4 cm. longis; foliis oppositis petiolatis apicem versus angustatis sed apice vero obtusis basi acutis margine serrulatis basin versus integris subchartaceis penniveniis utrinque exserto-reticulatis supra viridibus atomiferis subtus pallidioribus in venulis hirtellis costam versus parce arachnoideis 12–16 cm. longis 3–4.5 cm. latis; petiolo ca. 2 cm. longo gracili; corymbis terminalibus sessilibus a foliis superatis convexis modice densis ca. 1 dm. diametro; capitulis 7–8-floris breviter pedicellatis ca. 1 cm. longis et 4 mm. diametro; involucri laxe imbricati squamis ca. 11 ovatis vel oblanceolatis acutis ca. 3-seriatis dorso valde convexis subecostulatis granuliferis; corollis albis ca. 5.5 mm. longis glabris; tubo proprio ca. 2 mm. longo; faucibus cylindratis paullo ampliatis ca. 3.5 mm. longis; dentibus limbi valde recurvatis ca. 0.8 mm. longis; achaeniis flavescenti-brunneis 2.4–2.7 mm. longis ca. 0.8 mm. crassis basi paullo calcaratis apice cum cupula pappifera coronatis in angulis et apicem versus parce granuliferis; pappi setis 40–50 albis capillaribus inaequalibus.—PERU: in thicket at Mito, alt. 2745 m., July 23–Aug. 14, 1922, *Macbride & Featherstone*, no. 1742 (TYPE, Field Mus.; isotype, Gr.). This species is closely related to *E. pseudarboreum* Hieron. with which it shares many characters. It differs, however, in having larger leaves, which are somewhat arachnoid beneath and granular above, in the fact that its heads are only 7–8-flowered instead of about 14-flowered as in *E. pseudarboreum* and by having its achenes granuliferous instead of ciliolate on the angles; also in its less distinctly ribbed involucral scales. It is a pleasure to dedicate this notable species to its discoverer, Mr. J. Francis Macbride, now of the Field Museum.

E. (§ **Subimbricata**) **macromeris**, spec. nov., robustum herbaceum seu potius fruticosum elatum; caule subtereti recto medulloso primo laxe lanuginoso mox subglabrato; internodiis usque ad 17 cm. vel ultra longitudine; foliis oppositis breviter petiolatis late ellipticis apice acutis vel brevissime acuminatis basi rotundatis cuspidato-denticulatis (dentibus vix 0.7 mm. altis et ca. 5 mm. inter se distantibus) coriaceis penniveniis utrinque viridibus in costa venisque parce lanatis vel villosis aliter mox glabratis 10–13 cm. longis 5–6 cm. latis; petiolis latis grosse arachnoideo-lanatis supra canaliculatis 5–8 mm. longis; corymbis trichotomis planiusculis ca. 2 dm. latis; brunneo-hirsutis; capitulis pedicellatis ca. 1 cm. altis et 9 mm. diametro ca. 40-floris; involucri campanulati squamis ca. 24–30 subobtusis crassiusculis gradatis ca. 4-seriatis, intermediis late ovatis 3.7–4.5 mm. longis et 2 mm. latis, interioribus usque ad 7 mm. longis multo angustioribus ad paleas disci transientibus; corollis tubulatis glabris sine faucibus ullis distinctis ca. 5 mm. longis; dentibus limbi angustis ca. 0.4 mm. longis; achaeniis glabris gracilibus ca. 3 mm. longis 0.5 mm. crassis brunneis lucidis deorsum valde attenuatis; pappi setis ca. 20–25 capillaribus flavescenti-albidis paullo scabratis.—PERU: without more precise locality, *Herb. Pavon* (TYPE, hb. Univ. of Geneva). A plant of striking habit, perhaps as close to *E. endytum* Robinson as to any hitherto described Peruvian species, but of course differing markedly in its much shorter and broader petioles, flatter more corymbose inflorescence and in the nature of its indument. The disc appears to be somewhat chaffy toward the margin. The name alludes, of course, to the unusually long internodes.

E. (§ **Subimbricata**) **Mayorii**, spec. nov., ut videtur herbaceum verisimiliter perenne 1–1.5 m. altum alternirameum; caule subtereti plus minusve sulcato sordide brevissime arachnoideo-lanuloso medulloso 5 mm. vel ultra diametro; foliis oppositis vel subalternis petiolatis ovatis acuminatis serratis (dentibus plerisque 0.5–1.2 mm. altis 1.5–3.5 mm. latis) basi integris rotundatis vel cuneatis membranaceis a basi 3–5-nerviis supra in nervis venisque flavido-villosulis subtus in nervis et venis reticulatis sub lente ochraceo-lanulatis 4–8 cm. longis 2.5–5 cm. latis; petiolo 1–2 cm. longo ochraceo-griseo; corymbis irregulariter ramosis subpyramidatis ca. 6 cm. diametro; pedicellis plerisque 1–3 mm. longis; capitulis ca. 25-floris 5–6 mm. altis et crassis; involucri campanulati squamis ca. 3-seriatim imbricatis et gradatis dorso puberulis, exterioribus ovatis acutis ca. 1.8 mm. longis et 0.9 mm. latis, interioribus obtusiusculis ad 3.6 mm. longis et 1–1.4 mm. latis plerumque 3-striatis; corollis albis ca. 2.5–2.8 mm. longis 5-

costulatis; tubo proprio 0.7 mm. longo; faucibus gradatim paullo ampliatis ca. 1.5 mm. longis; limbi dentibus deltoideis vix 0.4 mm. longis obscure hispidulis; achaeniis nigris 1 mm. longis glabris; pappi setis ca. 30 albis corollam subaequantibus.—COLOMBIA: Dept. Tolima: Soledad, on road from Ruiz to Mariquita, alt. 1500 m., 6 Oct. 1910, *Dr. Eug. Mayor*, no. 104 (hb. Univ. Zürich, phot. and small fragm. Gr.).

This species resembles perhaps most nearly *E. obscurifolium* Hieron., which, however, has shorter-petioled leaves punctate beneath, larger more numerously flowered heads, involucral scales with a conspicuous basal callosity, roseate-lilac florets, and very different pubescence. It is a pleasure to dedicate this apparently distinct species to its collector whose explorations have contributed greatly to the knowledge of the flora of Colombia.

E. MICROSTEMON Cass. Dict. XXV. 432 (1822). When recently revising the Eupatoriums of Peru, Proc. Am. Acad. lv. 69 (1919), the writer commented on the fact that this species, now widely distributed as a weed in the warmer parts of America, had not been found among the older collections from Peru, though occurring in a comparatively recent one made by Messrs. Cook and Gilbert. The natural inference was drawn that it might have been of recent introduction in the country. However, in material belonging to the Herbarium of the University of Geneva and lately lent for study at the Gray Herbarium a characteristic specimen of *E. microstemon* is labelled as from Chachapoyas, Peru, and is said to have been obtained by Mathews in his last collection, that is to say probably about 1840.

E. (§ **Cylindrocephala**) **molinum**, spec. nov., fruticosum ramosum; ramis teretibus 2–4 mm. crassis atro-griseis obscure puberulis; internodiis 1–3 cm. longis; ramulis gracilibus foliosis puberulis vel subtomentellis; foliis ovatis vel ovato-ellipticis falcato-acuminatis remote crenato-dentatis (dentibus utroque 1–4 vix 1 mm. altis 3–5 mm. inter se distantibus) basi subrotundatis fere a basi 3-nerviis exsiccatione nigrescentibus supra glabris lucidulis tenuissime sulcato-reticulatis subtus opacis atomiferis in nervis puberulis ca. 3 cm. longis 13–17 mm. latis subcoriaceis; petiolo 5 mm. longo; corymbis ramulos foliosos terminantibus sessilibus ca. 5-capitulatis ca. 3 cm. diametro; pedicellis 1–2 cm. longis teretibus gracilibus curvato-adscendentibus; capitulis ca. 40–50-floris ca. 12 mm. altis ca. 6 mm. diametro; involucri ovali-subcylindrici squamis numerosis arcte imbricatis ca. 6-seriatis atro-brunneis leviusculis obscure nervatis, extimis ovatis acutis vel saltim cuspidatis, intermediis et interioribus oblongis vel ellipticis apice

rotundatis; axe involucri albido cylindrico a delapsu squamarum denudato cicatricoso, receptaculo proprio leviter convexo; corollis glabris ca. 4.5 mm. longis gracilibus, tubo proprio fauces paullo ampliatas subcylindricas fere aequante; achaeniis flavido-brunneis gracilibus glabris ca. 4 mm. longis; pappi setis tenuissimis ca. 28 albis sublevibus. —Venezuela: State of Mérida, Páramo del Molino, alt. 2000 m., 19 Feb. 1922, *Dr. Alfredo Jahn*, no. 950 (U. S., phot. and fragm. Gr.).

This species bears some resemblance to the Colombian *E. hypericifolium* HBK., but that, however, has entire, merely acute (not acuminate) leaves which are rusty-tomentellous beneath, also black achenes hispid on the angles. From *E. subscandens* Hieron. *E. molinum* differs in its much smaller leaves, considerably thicker and much more numerously flowered heads, broader, blunter involucral scales, etc.

E. (§ **Subimbricata**) **mollicomum**, spec. nov., basi ignota; caule ut videtur erecto herbaceo virgato 4 mm. crasso molliter brunneo-tomentoso usque ad inflorescentiam foliato 4 dm. vel ultra altitudine subtereti post exsiccationem costulato; foliis oppositis breviter petiolatis elliptico-oblongis apice obtusis vel rotundatis basi rotundatis margine obtuse serratis (serraturis utroque 12–15 vix 1 mm. altis ca. 4 mm. latis) submembranaceis penniveniis supra tomentellis subtus paullo pallidioribus molliter tomentosis (indumento griseo-brunneo) usque ad 5 cm. longis et 3 cm. latis; petiolo ferrugineo-tomentoso plerumque recurvo ca. 1 cm. longo; corymbo composito ca. 1 dm. lato convexo, partialibus densissimis subgloboso-congestis; capitulis 5-floris sessilibus 8 mm. longis 5 mm. diametro; involucri duplicis squamis ca 10, exterioribus linearibus atrorubris hispido-ciliatis saepe flexuosis (3–)5–6 mm. longis ca. 0.6 mm. latis, interioribus aequalibus rhombeo-oblongis vel -ovatis purpurascentibus apice rotundatis dorso griseo-tomentellis ca. 5 mm. longis 2–2.4 mm. latis; corollis cylindratis glabris 4.5 mm. longis sine faucibus distinctis; dentibus limbi anguste detoideis 0.6 mm. longis; achaeniis robustis atrobrunneis glabris lucidis 1.8 mm. longis 0.9 mm. crassis; pappi setis ca. 37 subaristiformibus paullo deorsum obcompressis et dilatatis stramineis 4–4.5 mm. longis.—Brazil: Minas Geraës, *A. de Saint-Hilaire* (journey of 1816–1821), no. 823 ter, Cat. C[1], no. 136 (Par., phot. Gr.).

This plant very clearly belongs in the little Series *Heterolaena* and among the previously described species most closely approaches *E. mollissimum* (Sch.-Bip.) Bak. and *E. dimorpholepis* Bak. Both these species, however, are said to be branching shrubs with larger

leaves which in *E. dimorpholepis* are pointed at both ends and in *E. mollissimum* are more coarsely toothed on the margin and distinctly cordate at the base.

E. (§ **Subimbricata**) **multifolium,** spec. nov., herbaceum erectum virgatum perenne griseo-tomentellum 3–4.5 dm. altum; caule subtereti dense foliosissimo ca. 3 mm. crasso post exsiccationem paullo costulato; internodiis plerisque 2–10 mm. longis; foliis lineari-spatulatis integerrimis sessilibus alternis fasciculatis 1.5–3.4 cm. longis 4–6 mm. latis apice rotundatis basi attenuatis utrinque in margine costaque griseo-tomentellis aliter subglabris sed dense glanduloso-punctatis; corymbo terminali composito planiusculo multicapitulato 8–14 cm. diametro griseo-tomentello; capitulis 5-floris breviter pedicellatis 7 mm. longis 4 mm. diametro; involucri squamis ca. 11 valde inaequalibus, extimis 1–2 linearibus bracteoliformibus, intermediis deltoideo-oblongis 2.5–3.5 mm. longis 1–1.5 mm. latis dorso griseo-tomentellis obtusis, interioribus 5 rhombeo-oblongis ca. 5 mm. longis 2 mm. latis dorso griseo-tomentellis ecostatis cymbiformibus apice rotundatis; disco planiusculo parvo; corollis cylindratis 4.5 mm. longis; dentibus limbi 0.8 mm. longis; achaeniis nigris glabris 2.2 mm. longis 1 mm. crassis; pappi setis ca. 43 flavescenti-albidis corollam subaequantibus. —Brazil? *A. de Saint-Hilaire* (Par., phot. Gr.).

This characteristic species belongs obviously to the Series *Dasynaphia*. From previously described species of this group it may be readily distinguished by its linear-spatulate fasciculate leaves which are tomentellous merely on the margin and midnerves. The sheet, though stated to come from the herbarium of Auguste de Saint-Hilaire, unfortunately bears no data of collection. It was received from the Museum of Natural History at Paris with a considerable number of plants secured by the same collector on his journey to southern Brazil in 1816–1821. There can be little doubt that this specimen also came from southern Brazil or possibly from Paraguay. The § *Dasynaphia* is largely confined to these countries.

E. (§ **Eximbricata**) **ocanense**, spec. nov., fruticosum 3 dm. vel ultra altitudine; caulibus suberectis teretibus juventate hispido-hirsutulis maturitate glabratis 3–4 mm. crassis foliosis deorsum delapsu foliorum mox denudatis; internodiis 1–4.5 cm. longis; foliis oppositis breviter petiolatis utroque acutis obscure serrulato-crenulatis penniveniis 3–6.3 cm. longis 1–2 cm. latis firmiter coriaceis supra costa profunde depressa et venis paullo pubentibus aliter glabris reticulo-venulosis subtus glabris lucidulis creberrime recticulatis; petiolo brevi lato supra profunde canaliculato vix 5 mm. longo; corymbo terminali

valde convexo denso patenter hirsutulo ca. 13 cm. diametro; bracteolis lanceolatis integerrimis crassis glabris 2–6 mm. longis; pedicellis 3–5 mm. longis flavido-hirsutulis; capitulis plerisque 4-floris ca. 8 mm. longis et 2.5 mm. diametro; involucri squamis ca. 12 valde inaequalibus sed vix imbricatis firmiusculis substramineis ciliolatis aliter glabris, interioribus ca. 4.5 mm. longis et 1.2 mm. latis ovato-oblongis apice rotundatis, exterioribus anguste ovatis multo brevioribus; corollis roseis glabris, tubo proprio ca. 1.3 mm. longo, faucibus cylindratis ca. 3 mm. longis; dentibus limbi recurvatis ca. 0.8 mm. longis; achaeniis ca. 2.6 mm. longis nigrescentibus in angulis apicem versus paullo hispidulis; pappi setis ca. 40 inaequalibus 2–4.5 mm. longis flavescenti-albidis paullo scabridis.—COLOMBIA: shrub with roseate flowers, Province of Ocaña, on paramos at an altitude of 2440–3050 m., collected on journey of 1846 to 1852, *L. Schlim*, no. 357 (TYPE, hb. Univ. of Geneva, phot. and small fragm. Gr.).

Sharing rather closely the habit of *E. pomaderrifolium* Benth., this species differs in its coarser more spreading pubescence, shorter and broader petioles, as well as in its slightly larger leaves which are more pointed at each end and glabrous beneath. It is doubtless the analogous species on the paramos of the Sierra Nevada to *E. pomaderrifolium* on those about Bogotá and *E. Jahnii* in the highlands about Mérida, Venezuela.

E. (§ **Subimbricata**) **neglectum**, spec. nov., verisimiliter herbaceum erectum 4 dm. vel ultra altitudine (basi ignota); caule tereti 5 mm. diametro medulloso infirmo modice ramoso usque ad inflorescentiam foliato tomentoso, indumento purpureo-brunneo, pilis sub lente purpureo-articulatis attenuatis; internodiis 5–11 cm. longis; foliis oppositis petiolatis ovatis gradatim acuminatis serratis (serraturis utroque ca. 12–14 ca. 1–1.5 mm. altis et 3–5 mm. latis) basi rotundatis vel distincte cordatis membranaceis usque ad 6–7 cm. longis 3–3.5 cm. latis supra atroviridibus rugulosis breviter pubescentibus subtus paullo pallidioribus copiose molliterque pubescentibus fere a basi 3(–5)-nerviis; petiolo ca. 1 cm. longo dense brunneo-tomentoso; corymbo terminali composito 1.5 dm. diametro rotundato, partialibus densis subglobosis; capitulis ca. 10-floris sessilibus congestis; involucri squamis ca. 12 paullo purpurascentibus apice rotundatis ciliatis ca. 3-seriatim imbricatis, extimis 3–4 ovatis dorso pubescentibus, ceteris oblongis vel oblanceolato-oblongis dorso glabris striatis; corollis albis gracilibus glabris fere a basi ad limbum gradatim leviter ampliatis ca. 5.4 mm. longis; dentibus limbi ca. 0.4 mm. longis; achaeniis purpureo-brunneis glabris ca. 2.4 mm. longis cum

cupula (0.2 mm. alta) albida pappifera coronatis; pappi setis ca. 33 laevibus 4.5 mm. longis.—Brazil: Minas Geraës, *A. de Saint-Hilaire* (journey of 1816–1821), no. 724, Cat. D., no. 524 (Par., phot. Gr.).

This species must in many respects resemble *E. semistriatum* Bak., known to the writer only from character and from photograph of the type at Kew. Baker describes the involucral scales in his species as biseriate, acute, dorsally pilose and pale. From this it seems quite impossible that his plant could have been conspecific with the one here characterized. The involucre is here almost as imbricated as in some species of § *Cylindrocephalum* but, the scales being early disposed to spread somewhat and showing greater ability to persist than is usual in § *Cylindrocephalum*, it seems best to refer the plant to § *Subimbricata*, where it appears to be among its nearest relatives.

Eupatorium (§ **Praxelis**) **porophylloides**, spec. nov., glaberrimum herbaceum 2.4–2.8 dm. altum; caulibus 1–2 vel pluribus ab caudice lignescente suberectis flexuosis gracilibus subteretibus post exsiccationem costulatis dense foliatis vel inferne post delapsum foliorum denudatis ad mediam partem saepius trichotomis; internodiis 4–15 mm. longis; foliis oppositis anguste linearibus integris glaberrimis uninerviis sessilibus apice obtusis callosis 1–3.5 cm. longis 0.6–1 mm. latis adscendentibus vel subappressis; pedunculis erectis vel curvato-adscendentibus 4–7.5 cm. longis gracilibus; capitulis paucis ad apicem pedunculi solitariis erectis ca. 25–30-floris 1 cm. altis 7 mm. diametro; involucri turbinati campanulati squamis ca. 28 ca. 5-seriatim imbricatis arcte adpressis regulariter gradatis obtusis purpureis 3–5-striatis; receptaculo hemisphaerico glabro; corollis violaceis ca. 5 mm. longis glabris; tubo proprio ca. 1.3 mm. longo in fauces vix distinguendas subcylindratas ca. 3.5 mm. longis ampliato; dentibus limbi deltoideis patentibus ca. 1 mm. longis; achaeniis nigris ca. 2 mm. longis deorsum decrescentibus in faciebus strigillosis et in angulis costiformibus pallidis sursum ciliolatis; pappi setis ca. 23 paullulo scabratis albidis apicem versus purpureo-tinctis.—Bolivia: Dept. of Santa Cruz: Prov. of Chiquitos: on high plain of the Cerro de Santiago, alt. 800 m., May, 1907, *Th. Herzog*, no. 24 (herb. Univ. of Zürich, phot. and slight fragm. Gr.).

This species, clearly of § *Praxelis*, stands nearest some of the narrow-leaved forms of *E. kleinioides* HBK. but differs in its wholly glabrous character, its entire narrowly linear almost filiform leaves, its very short internodes, and its obtuse involucral scales. It is also provided with a lignescent caudex, as much as 6 mm. in diameter, which suggests a perennial nature.

E. praefictum, spec. nov., fruticosum (saltim distincte lignescens) subglabrum; caule dichotomo tereti a cortice griseo pallide flavescente tecto mox delapsu foliorum denudato et cicatricoso 4 mm. vel ultra diametro; ramis curvato-adscendentibus apicem versus foliosissimis; internodiis 1–3 mm. longis; foliis spiraliter dispositis linearibus vel angustissime oblanceolatis 4–7 cm. longis 1.8–4.5 mm. latis integris apice conspicue calloso-induratis basi gradatim angustatis sessilibus subcarnosulis glabris unicostatis; corymbis terminalibus paullo convexis 3–8 cm. diametro densis folia vix superantibus subglabris; pedicellis 3–10 mm. longis; bracteolis 1–3 lanceolato-subulatis; capitulis ca. 5-floris 1 cm. longis; involucri squamis ca. 10–12 acuminatis, extimis linearibus vel anguste ovato-lanceolatis laxis, mediis et intimis oblongo-obovatis ciliolatis in parte media herbaceis et costulatis lateraliter tenuissimis albidis; corollis ca. 7 mm. longis glabris ut videtur pallidis; tubo proprio ca. 2 mm. longo; faucibus 4 mm. longis; dentibus limbi deltoideis 1 mm. longis; achaeniis 5-angulatis (cum vel absque nervis 1 vel 2 secundariis) nigrescentibus 3.3 mm. longis in angulis nervisque pallidis superne hirtellis; pappi setis ca. 30 valde inaequalibus 4–6 mm. longis pallide ochroleucis sursum paullo barbellatis.—Brazil: Minas Geraës, *A. Saint-Hilaire* (journey of 1816–1821), Cat. B[1], no. 1990 (Par., phot. Gr.).

A very well marked species, with somewhat the habit of *Agrianthus campestris* but with the pappus and other technical characters of *Eupatorium*. The involucral scales are more decidedly unequal than is usual in § *Eximbricata* but less closely imbricated than is commonly the case in § *Subimbricata*. The species appears to have no very close relative, but may be provisionally placed in or next to the Ser. *Dasynaphia*. The specific name alludes of course to the callous tips of the leaves.

E. pumilum (Gardn.), comb. nov. *Bolbostylis pumila* Gardn. in Hook. Lond. Jour. Bot. v. 470 (1846). Gardner's *Bolbostylis pumila* was reduced by Baker in Mart. Fl. Bras. vi. pt. 2, 309 (1876) to the synonymy of *Eupatorium amphidictyum* DC. and Baker's description of the latter species seems to have been drawn largely with the traits of the former in mind. Dr. Hochreutiner, Bull. N. Y. Bot. Gard. vi. 292 (1910), was the first to observe inconsistency between the real *E. amphidictyum* of DeCandolle and a portion of the material (Martius's no. 830) which had been referred to it by Baker, l. c., but, having insufficient material to permit a detailed study of the plant of von Martius, Hochreutiner merely states that "if it is a *Eupatorium* it is a new species." To the writer there seems no doubt whatever

that the plant represented by Martius's no. 830 is a *Eupatorium*, but it seems certainly identical or at least conspecific with Gardner's clearly described though ineptly named *Bolbostylis pumila*. While Hochreutiner is clearly right in maintaining that this plant, with its relatively long and narrow scarcely reticulated leaves and elongated pedicels, is quite distinct from *E. amphidictyum* and that it represents an independent species of *Eupatorium*, it is certainly necessary to apply to it Gardner's valid, though somewhat ill-chosen, specific name, since this has not been previously employed in *Eupatorium* except for *E. pumilum* Wender ex Steud. Nom. ed. 2, i. 608 (1840), a nomen nudissimum of no possible validity or claim to recognition.

To *E. pumilum* may be referred not merely Martius's no. 830, but *A. Saint-Hilaire's* no. 823 bis (Par.).

Clearly conspecific with these yet differing markedly in much greater luxuriance is the following:

E. PUMILUM, var. **vegetius** var. nov., elatius ad 6 dm. altum usque ad inflorescentiam foliatum; foliis quam apud var. typicam multo majoribus usque ad 13 cm. longis et 5–6 cm. latis; aliter var. typicae simillimum.

It seems best to put on record this large variety, since should it be found without some evidence of transition, it could scarcely be referred with confidence to the usually much lower and less leafy-stemmed *E. pumilum*.

E. PYCNOCEPHALUM Less. Linnaea, vi. 404 (1831). This species, one of the most common and widespread of the genus and often appearing to be an introduced weed, is subject to considerable variation in such matters as stature, leaf-contour, density of inflorescence, etc. Especially in the matter of pubescence there is great variability. The nomenclatorial type appears to have been a rather smooth or at least smoothish plant, but even in the same region the species passes by imperceptible transitions to forms with rather copious pubescence, and it has not seemed feasible to make any useful separation on the basis of the quantity of pubescence. However, the following form may be readily recognized not by the mere abundance of the indument but by the nature of the hairs.

Forma **glandulitectum**, forma nova, ubique dense cum glandulis breviter stipitatis vel sessilibus fere modo *E. glandulosi* obtectum; aliter formam typicam simile.—MEXICO: Querétaro, collected by *Bro. Agniel*, 1910–1913, and forming no. 10598 in the large series of Mexican plants distributed by *Bro. Arsène* (Gr., Mo.).

E. Radula Chod. Bull. Herb. Boiss. ser. 2, ii. 311 (1902). Prof. Chodat in characterizing this species describes the leaves as one-fourth to one-fifth as wide as long and this relation in the main holds good in regard to the material seen by the writer. Chodat & Hassler have later proposed, l. c. ser. 2, iii. 707 (1903), two varieties of the plant, namely: var. *obtusifolium*, with the leaves of the inflorescence obtuse and more crenate, founded upon Hassler's no. 7779; and var. *serratum* with leaves acutely serrate, margined, and more strongly nerved beneath, founded on Hassler's no. 8538. From all these forms of the species, however, the following material recently received from the Museum of Natural History at Paris for study at the Gray Herbarium, while agreeing with *E. Radula* very closely in all important details, differs so conspicuously in its much more slender habit and very narrow leaves as to appear at first sight a distinct species. Such separation might indeed seem the correct treatment were the leaves of the other varieties of uniform breadth, but in fact they occasionally show considerable variability even on the same stem. This being the case, it appears probable that the leaf-breadth is here largely determined by the conditions of growth and that the following slender plant represents merely an extreme of variation.

Var. **stenophyllum**, var. nov., stricte virgatum gracile rigidum; caulibus vix 2 mm. crassis; foliis inferioribus et mediis linearibus serratis venosis 2–6 mm. latis; aliter var. typico et var. *serrato* simillimum.—Brazil: prov. São Paulo, *A. de Saint-Hilaire* (journey of 1816–1821), no. 838, Cat. C[1], no. 987 (Par., phot. Gr.).

E. (§ **Praxelis**) **sanctopaulense**, spec. nov., gracile diffuse ramosum; caule tereti vix 2.5 mm. diametro tamen distincte lignescente brunnescente puberulo; ramis tenuibus numerosis curvato-ascendentibus usque ad inflorescentiam foliatis plerumque simplicibus 2–3 dm. longis; foliis vel oppositis vel subternis vel alternis in ramo eodem sessilibus anguste linearibus integerrimis vel apicem versus obsolete subdentatis utroque attenuatis 1.5–2 cm. longis 1–1.5 mm. latis 3-nerviis obscure in margine et costa parce pubentibus; internodiis plerisque ca. 1 cm. longis; corymbis terminalibus laxis; pedicellis filiformibus 3–30 mm. longis; capitulis ca. 20-floris erectis ca. 7 mm. longis 5–6 mm. diametro; involucri campanulato-subcylindrati ca. 4-seriatim imbricati squamis ca. 27 gradatis obtusiusculis mucronulatis purpureo-tinctis 3-nervatis glabriusculis apicem versus obscure ciliolatis, intimis ca. 5.5 mm. longis et 1 mm. latis; disco vix conico-elevato; corollis glabris ut videtur atropurpureis ca. 4.2 mm. longis; tubo proprio ca. 0.8 mm. longo; faucibus cylindratis paullo ampliatis ca.

2.6 mm. longis; dentibus limbi deltoideis 0.6 mm. longis; achaeniis (immaturis) 2 mm. longis in costis sursum parce hispidulis; pappi setis ca. 27 stramineo-albidis ca. 3.5 mm. longis vix scabratis.—Brazil: prov. São Paulo, *A. de Saint-Hilaire*, Cat. C² no. 1401 (Par., phot. Gr.).

This species probably approaches most closely *E. asperulaceum* Bak., which, however, according to its original description was an annual with 15-flowered heads and distant linear leaves of considerably greater size (3.5–5 cm. long and 3.5–5 mm. wide). Although the base of the present plant is not shown in the material at hand, the stem, though slender, is solid and woody as if certainly perennial.

E. solidaginoides HBK. Nov. Gen. et Spec. iv. 126 (1820). To the synonymy of this rather widely distributed and somewhat variable species may be added *E. decussatum* Klatt, Bull. Soc. Bot. Belg. xxxv. pt. 1, 295 (1896). Klatt founded his proposed new species solely upon no. 9869 in Prof. Pittier's extensive series of Costa Rican exsiccatae. This number was collected by Tonduz in thickets on the banks of the Virilla River, near San Juan, Costa Rica. The specimen labelled in Klatt's hand is now in the Gray Herbarium and shows only lateral branches with small leaves and scarcely developed inflorescences. When compared with lateral branches of *E. solidaginoides* at a similar stage of development it shows perfect correspondence in habit and no differences in technical details worthy of mention.

E. (§ Subimbricata) urubambense Robinson, Proc. Am. Acad. lv. 38, 65 (1919). Material recently received and agreeing perfectly with the typical form of this species in its essential characters shows what appear to be two strong strains which are probably to a considerable extent developed in response to differences of environment but are so pronounced as to claim at least varietal recognition, as follows:

Var. **typicum**, fruticosum ad 2.4 dm. altum laxe ramosum; ramis 2–4 dm. vel ultra longis gracilibus flexuosis; internodiis elongatis (usque ad 8–9 cm. longis); foliis plerumque 3–4 cm. longis; involucri squamis distincte marginatis.—Peru: in Valley of Ymay [?], Urubamba, Cuzco, *Pentland* (K., phot. and fragm. Gr.); Urubamba Valley, *E. D. W. & M. M. Holway*, no. 759 (Gr.); Ollantaytambo, alt. about 3000 m., *Cook & Gilbert*, no. 336 (U. S.).—Described by Prof. Holway as a slender shrub.

Var. **determinatum** var. nov., fruticosum multo humilius 3–6 dm. altum rigidiuscule breviterque ramosum; axe repetitive aborto et

pseudo-dichotome ramoso; internodiis 0.5–3.8 cm. longis; foliis 1.5–2.5 cm. longis; involucri squamis obscure marginatis vel omnino immarginatis.—PERU: on southern slope, in open ground, 6 dm. high, flowers white or very pale lilac, Yanahuanca, alt. 3050 m., June 16–22, *Macbride & Featherstone*, no. 1181 (TYPE, Field Mus.; isotype, Gr.); gulches of red clay hills, about 3 dm. high, flowers pale lavender, fragrant, Llata, alt. about 2135 m., Aug. 21, 1922, *Macbride & Featherstone*, no. 1990 (Field Mus., Gr.).

In var. *determinatum* the axis tends repeatedly to die at the tip and be surpassed by the opposite curved-ascending somewhat rigid branches, hence the name.

A SECOND SPECIES OF EUPATORIASTRUM.—When, some years ago, the writer pointed out (Proc. Am. Acad. li. 537 (1916)) the correspondence of *Bulbostylis triangularis* DC. and *Eupatorium vitifolium* (Sch.-Bip.) Klatt, the comparison was made on the basis of a photograph of the former taken at the DeCandolle herbarium in Geneva and some fragments of the latter present in the Klatt herbarium. While the specific identity was fairly evident, the material at hand did not permit thorough study. Happily, the problematic plant has been again found among some undetermined *Eupatorieae* recently lent from the United States National Herbarium for study and identification at the Gray Herbarium. This new material consists of two sheets representing P. B. Reko's no. 3539, collected at Apango, Oaxaca, alt. 450 m., 9 Oct. 1917. These specimens prove what was suspected by the writer, l. c., namely that the leaf-base varies from truncate or rounded to distinctly cordate. More important, however, is the fact that the long narrow pales on the disk are far more numerous than previously realized. They are, in fact, so abundant and characteristic as to recall very definitely the hitherto monotypic genus *Eupatoriastrum* Greenman and after careful comparisons it now seems that the problematic plant which has successively been referred to *Bulbostylis*, *Carphephorus*, *Hebeclinium* and *Eupatorium* is in fact a very close ally of *Eupatoriastrum Nelsonii* Greenman, sharing all its significant technical characters and exhibiting much the same general habit. On the other hand, neither of these coarse herbs with loose inflorescence of large heads and with copiously paleaceous receptacle possesses close resemblance or shows near approach to any undoubted species of *Eupatorium*. It is best, therefore, to make the following new disposition of the plant under discussion.

Eupatoriastrum triangulare (DC.), comb. nov. *Bulbostylis triangularis* DC. Prod. vii. 268 (1838). *Carphephorus triangularis* (DC.)

Gray, Pl. Wright. i. 86 (1852), by implication, and acc. to Hemsl. Biol. Cent.-Am. Bot. ii. 109 (1881). *Eupatorium vitifolium* (Sch.-Bip.) Klatt, Leopoldina, xx. 90 (1884); Robinson, Proc. Am. Acad. li. 537 (1916). *Hebeclinium vitifolium* Sch.-Bip. ex Klatt, l. c.—SOUTHERN MEXICO, State of Oaxaca, at San Miguel ("Ladani"), *Liebmann*, no. 246 (sketch and fragm. Gr.); Apango, *Reko*, no. 3539 (U. S., fragm. Gr.). MEXICO. WITHOUT LOCALITY: *Haenke* ("Prodromus herbarium" of DeCandolle, phot. Gr.).

While *Eupatoriastrum Nelsonii* and its var. *cardiophyllum* Robinson & Greenman, Proc. Am. Acad. xli. 277 (1905) both have broadly ovate to suborbicular leaves rather finely toothed but nearly or quite without lobes or angles, the leaves of *E. triangularis* are triangular-ovate with spreading acute basal lobes and with or without some lesser lobing higher on the blade. In both species the margin is cuspidate-dentate. In *E. triangularis* the larger involucral scales are about 1 cm. long, attenuate to an entire very sharp tip and dorsally marked with three dark veins. In *E. Nelsonii* and its variety they are 6–8 mm. long and narrowed much more abruptly to a merely acute erose-fimbriolate tip, while dorsally they are scurfy and without conspicuous veins. In *E. triangularis* the corollas are about 8 mm. long, in *E. Nelsonii* about 5 mm.

There is no doubt that these plants represent two distinct species, but their resemblance in many details is so pronounced that it is impossible to doubt their close relationship and the fact that they should be treated as congeneric. From the small, compact, and *Liatris*-like genus *Carphephorus* of the southeastern United States, these two plants of southern Mexico differ so widely in habit and are geographically so far removed as to render any generic union strained and artificial.

Mikania (§ **Thyrsigerae**) **Broadwayi**, spec. nov., verisimiliter volubilis perennis et paullo lignescens multis *M. punctatum* simulans; caule tereti costulato glabrato; foliis deltoideo-ovatis caudato-acuminatis basi rotundatis vel subtruncatis ad insertionem petioli leviter sinu clauso cordatis vel ut videtur peltatis supra basin hastatis lobum brevem divaricatum acutum utroque modo *M. punctati* gerentibus margine obscure cuspidato-denticulatis membranaceis ca. 7-nerviis utrinque viridibus prominulenter reticulatis glabris subtus paullo pallidioribus ca. 15 cm. longis ca. 10–12 cm. latis; petiolo ca. 4 cm. longo obscure villosulo; panicula ovoidea 12–16 cm. longa 8–12 cm. crassa adpresse pilosula; bracteis ellipticis petiolatis, primariis foliaceis, superioribus multo reductis lanceolatis ca. 5 mm. longis;

capitulis ad apices ramulorum fastigiatim subracemosis ca. 8 mm. longis; pedicellis 2–6 mm. longis plerisque supra mediam partem bracteolam viridem lanceolatam gerentibus; involucri squamis 4 membranaceis viridibus late oblongis apice rotundatis glabriusculis multinervatis 5 mm. longis 2.3 mm. latis margine tenuiter ciliato-erosis; corollis glabris ut videtur albis, tubo proprio gracili 2 mm. longo; faucibus abrupte campanulatis 1.5 mm. altis, dentibus limbi deltoideis fauces subaequantibus; achaeniis nigrescentibus 3 mm. longis, 0.5 mm. crassis parce pubescentibus; pappi setis ca. 40 distincte barbellatis flexuosis albidis.—TRINIDAD: Heights of Aripo, *W. E. Broadway*, Jan. 10–26, 1922 no. 9828 (TYPE in Gray Herb.).

This plant, recently forwarded to the Gray Herbarium from the New York Botanical Garden, at once recalls by its foliage *M. punctata* Klatt, a species extending from Mexico to Venezuela and Bolivia, but differs in inflorescence, broader involucral scales, shorter proper tube of the corolla, more decidedly reticulate leaves, shorter, stouter and more pubescent achenes, etc. In *M. punctata* the heads are mostly shorter-pedicelled and grouped in somewhat globular glomerules, the proper tube of the corolla is fully 3 mm. long, exceeding the combined throat and limb, and the achenes are about 4 mm. long, very slender and nearly smooth or merely granular.

It is with pleasure that I name this species for its collector a veteran explorer of difficult tropical regions.

M. CINNAMOMIFOLIA Lingelsheim in Fedde, Rep. vii. 251 (1909). When publishing (Contrib. Gray Herb. lxiv. 96–115) upon the Bolivian Mikanias, the author had not seen any material of *M. cinnamomifolia*. From the original diagnosis it was impossible to separate it on any satisfactory characters from the earlier *M. dioscoreoides* Rusby. Accordingly it was doubtfully referred to the synonymy of that species. Subsequently, through a loan kindly sent from the United States National Herbarium, it has been possible to compare isotypes of *M. cinnamomifolia* and *M. dioscoreoides*. It is obvious that these plants are closely related. However, there seem to be differences adequate to show them to be distinct species. The leaves of *M. cinnamomifolia* even at full maturity are elliptic- or lance-oblong, 8–12 cm. in length, 3–4.2 cm. wide, of a papery-membranaceous texture, dull and obscurely pubescent beneath (on the surface as well as on the ribs and veins). In strong transmitted light they are finely translucent-punctate. The involucral bracts are pale-stramineous, rounded at summit and distinctly pubescent dorsally. In *M. dioscoreoides*, on the other hand, the mature leaves become much broader and ovate,

being sometimes as much as 2 dm. long and about half as wide. They are much thicker, rather firmly coriaceous and more definitely prominulent-reticulated, glabrous beneath. In transmitted light they are opaque except for a very few widely scattered points. The involucral scales are more narrowly oblong, less conspicuously rounded at tip, and nearly or quite glabrous on the back. The lack of precisely equivalent stages of development makes it still difficult to be sure of differences in the florets or achenes. The material examined has been as follows:

M. dioscoreoides Rusby: Dept. Cochabamba, near town of Cochabamba, *Bang*, no. 1256 (Gr., N. Y., U. S., Mo., Philad., Field Mus.); Antahuacoma, Espiritu Santo (160 km. northeast of Cochabamba), *Buchtien*, no. 2297 (U. S., Gr.).

M. cinnamomifolia Lingelsh. Dept. La Paz: San Carlos, near Mapiri, alt. 750 m., *Buchtien*, nos. 1398, 1508 (U. S.).

M. DESMOCEPHALA Robinson, Contrib. Gray Herb. n. s. lxiv. 113 (1922). This species, founded upon Dr. Rusby's no. 1740 and thus far known only from the original material, is represented by Dr. Buchtien's no. 1550 from San Carlos near Mapiri, in the tropical region at an altitude of 750 m. Dr. Buchtien's label indicates that the plant is a twining shrub reaching a height of 3–4 m. and growing in the woods. This new material corresponds so closely with the type that there can be no question that it is conspecific, yet it shows some variation. Its leaves instead of being uniformly rounded at base are sometimes openly cordate. They are granular-puberulent above and somewhat hirtellous beneath. Re-examination of the type material in which the leaves were incorrectly described as glabrous on both surfaces discloses at least on some of the younger leaves traces of puberulence. Dr. Buchtien's rediscovery of this species is particularly fortunate since it makes it possible to assign to it a definite geographical locality.

Mikania (§ **Corymbosae**) **dictyota,** spec. nov., volubilis gracilis ut videtur herbacea ubique subglabra; caule flexuoso torto tetragono vel hexagono ca. 2.5 mm. crasso brunneo vel atropurpureo; internodiis 5–10 cm. longis; foliis ovatis cuspidato-acuminatis profunde cordatis utroque 3–8-dentatis (dentibus cuspidatis 0.5–3 mm. altis 4–10 mm. basi latis) coriaceis vix discoloribus utrinque valde reticulatis 2.8–5 cm. longis 2.2–4 cm. latis a basi 5–7-nervatis; petiolis gracilibus 1–3 cm. longis supra canaliculatis puberulis, eis ejusdem jugi basi ab annulo prominulo transverse conjunctis; corymbis numerosis parvis ca. 3 cm. diametro (valde immaturis) leviter convexis plerisque ramulos paten-

tes terminantibus; bracteolis ovatis acuminatis 7.5 mm. longis et 4 mm. latis in summo pedicelli orientibus; involucri squamis anguste oblongis purpurascenti-viridibus apicem versus puberulis dorso glandulari-atomiferis et obscure striatulis ca. 9 mm. longis et 1.7 mm. latis; corollis (valde immaturis) ca. 5.5 mm. longis apicem versus atomiferis, dentibus limbi linearibus 3 mm. longis tubum et fauces superantibus; pappi setis ca. 75; achaeniis valde immaturis.—Bolivia: Unduavi, Nor Yungas, in the Andean region, 3200 m. alt., *Dr. Otto Buchtien*, no. 4762 (U. S., Gr.). An attractive species with some habital similarity to the Peruvian *M. brachyphylla* Hieron. and the Ecuadorean *M. Andrei* Robinson but with considerably larger leaves and much longer corolla-teeth than either of these.

M. (§ **Corymbosae**) **Featherstonei**, spec. nov., volubilis fruticosa inter frutices scandens; caulibus teretibus molliter lignescentibus sordido-tomentosis ad 5 mm. vel ultra crassis; internodiis ad 11 cm. longis; foliis oppositis petiolatis ovatis acuminatis undulato-subdentatis vel fere integris basi rotundatis vel profunde cordatis supra scaberrimis rugosis (venulis reticulatis depressis) subtus prominenter reticulato-venosissimis sordide tomentosis supra basin pinnatim 6–8-nervatis 10–15 cm. longis 7–9 cm. latis crassiuscule membranaceis; petiolis gracilibus tomentosis 3–4 cm. longis; eis ejusdem jugi neque connatis neque cum linea transversa basi conjunctis; appendicibus stipularibus nullis; corymbis axillaribus pedunculatis valde convexis vel subglobosis 4–8 cm. diametro tomentellis; capitulis brevissime pedicellatis subglomeratis ca. 15 mm. altis ca. 9 mm. diametro; involucri ca. 10 mm. longi squamis exterioribus oblongis obtusis dorso scabratis ca. 3.5 mm. latis herbaceis obscure multinervatis, squamis interioribus obovato-oblongis similibus sed glabriusculis solum apicem versus paullo scabratis basi callosis; corollis viridi-albis; limbi patentis dentibus ca. 2 mm. longis; faucibus vix ullis; tubo cylindrato gracili saepe curvato extus paullo scabrato ca. 5.5 mm. longo; antherarum columna exserta purpurea; achaeniis 5-angularibus 6 mm. longis deorsum decrescentibus paullo scabratis; pappi setis ca. 90 brunnescenti-albidis ca. 6.5 mm. longis.—Peru: twining in shrubs of stream bank, Pueblo, 3 miles below Ambo, Tomaiquichua, alt. about 2600 m., Sep. 19, 1922, *Macbride & Featherstone*, no. 2428 (type, Field Mus.; isotype, Gr.). This species, with the coarse, wrinkled foliage of *M. bullata* and *M. rugosa*, is clearly of the § *Corymbosae*. Its heads are commonly in 3's but are distinctly pedicelled. It appears to have no near relatives in Peru.

M. FLACCIDA Robinson, Contrib. Gray Herb. n. s. lxiv. 9, 109 (1922). In some material recently acquired by the United States National Herbarium there has been found a second sheet of this characteristic species. Its label indicates the following data of collection. San Carlos near Mapiri, Bolivia, in the tropical region at an altitude of 750 m., August, 1907, *Dr. Otto Buchtien*, no. 1960. It is unfortunately very immature, but its correspondence with the original material from Polo-Polo near Coroico, alt. 1100 m., seems to be perfect.

MIKANIA GUACO H. & B. Pl. Aeq. ii. 84, t. 105 (1809). Some months ago, in Contrib. Gray Herb. n. s. lxiv. 10–11 (1922), I recorded the occurrence of this South American species on Trinidad from the evidence of a poor old specimen without collector's name and destitute of precise data as to locality. Subsequently an excellent specimen was received from Prof. Britton which was collected by Mr. W. E. Broadway on the Heights of Aripo, Trinidad, Jan. 10–26, 1922 (no. 9830). This closely matches South American material of *M. guaco* and fully establishes the occurrence of the species on the island of Trinidad.

MIKANIA LANUGINOSA DC. Prod. v. 201 (1836). To the synonymy of this species may be added *M. Banisteriae* Buchtien, Contrib. Fl. Boliv. i. 190 (1910), not DC.

M. (§ **Corymbosae**) **oreimeles**, spec. nov., fruticosa ad 3 m. altitudine scandens; caule flexuoso fistuloso subtereti post exsiccationem costulato praesertim nodos versus brunneo-hirsuto; internodiis usque ad 1 dm. longis; foliis oppositis graciliter petiolatis ovatis acuminatis utrinque viridibus supra sparse hirtis subtus paullo pallidioribus pubescentibus 5–7 cm. longis 3–3.5 cm. latis mebranaceis a basi 3(–5)-nerviis margine crenatis vel subserratis vel undulatis vel etiam integriusculis; petiolo 1.5–2.5 cm. longo; corymbo composito denso planiusculo 6–13 cm. lato; bracteolis lanceolato-linearibus; ramulis corymbi late patentibus; capitulis numerosis ca. 6 mm. altis; involucri squamis anguste oblongis apice rotundatis basi subcalloso incrassatis dorso viridibus plus minusve pubentibus ca. 4 mm. longis; corollis ut videtur albidis vel pallide ochroleucis glabris; tubo proprio ca. 1.5 mm. longo gracili; faucibus turbinatis ca. 0.7 mm. altis; dentibus limbi ca. 1.2 mm. longis lanceolato-deltoideis; achaeniis nigrescentibus ca. 2 mm. longis deorsum decrescentibus; pappi setis albis ca. 35.—*M. Schultzii* Robinson, Contrib. Gray Herb. n. ser. lxiv. 19, 111 (1922) in part, that is as to plants of Bang and of Buchtien, but not as to type, namely plant of Mandon. *Willoughbya scandens* "form near var.

barbinervia," Rusby, Mem. Torr. Bot. Club, vi. 58 (1896).—BOLIVIA: Dept. Cochabamba: Espirito Santo, 1891, *Bang*, no. 1267 (TYPE, Gr., N. Y., U. S., Philad., Field Mus., Mo.). Dept. La Paz: Prov. Nor Yungas, in thickets, Unduavi, alt. 3300 m., *Buchtien*, no. 198 (N. Y.); also in woods at same locality, alt. 3200 m., *Buchtien*, nos. 683 (U. S., fragm. Gr.) and 4183 (U. S., Gr.).

This species, when well developed, is rendered somewhat striking by the candelabra-like form of its compound corymb of which the lateral branches are conspicuously elongated and widely spreading. For technical distinctions between this species and its nearest Bolivian relatives see key under *M. Schultzii* below.

M. PENNELLII Robinson, Contrib. Gray Herb. n. ser. lxi. 19 (1920), lxiv. 43 (1922). When described this characteristic species was known to the writer only from material collected by Dr. Pennell in the neighborhood of Villavicencio in central Colombia. However, the species has again been found among specimens from the herbarium of Dr. Otto Buchtien recently purchased by the United States National Herbarium. It proves, in fact, to be the plant collected by Dr. Buchtien at San Carlos near Mapiri, Bolivia, as his no. 1554, and reported in his Contrib. Fl. Boliv. i. 190 (1910) as *M. hastata* (L.) Willd., of which the determination was doubted on geographic grounds by the writer, Contrib. Gray Herb. n. ser. lxiv. 114 (1922). The real *M. hastata* is an essentially West Indian plant, barely reaching northern Venezuela. It has sessile heads in long regular paniculately disposed spikes, the involucral scales are oblong and rounded or merely mucronate at the tip, and the corollas are funnelformed and white. *M. Pennellii*, on the other hand, has the heads for the most part distinctly pedicelled and borne in an irregularly subracemose manner on the branchlets of an open thyrse, the involucral scales oblanceolate and acute, and the greenish-yellow corollas with slender tube and rotate limb. While it is surprising to find a plant of central Colombia reappearing in Bolivia, it is to be observed that in this case both occur at similar low altitudes on the eastern side of the Andes in the wooded tropical region, probably under by no means dissimilar climatic conditions. It is also to be remembered that the intervening territory on the east of the Andes has been very imperfectly explored and that climbing plants are not favorites with collectors in difficult regions.

M. (§ CORYMBOSAE) SCHULTZII Robinson, Contrib. Gray Herb. n. ser. lxiv. 111 (1922). A re-examination of this species in the light of related material lately received makes it clear that two specimens covered by the original description are in reality separable as an

independent species, which is characterized above as *M. oreimeles*. The segregation of this new species makes it desirable to recast the alternatives lettered "*l*" in the author's key to the Bolivian Mikanias of § *Corymbosae*, l. c. 105. It is believed that the following characters will adequately distinguish the species in question from its closest Bolivian relatives.

l. Involucral scales oblanceolate, acute or acutish, thin, finely but distinctly nerved; corolla-teeth broadly deltoid, widely spreading or recurved, shorter than the companulate throat. . . . . 25. *M. micrantha.*

l. Involucral scales narrowly oblong, rounded at the tip, firmer in texture, callous-thickened at base, obscurely if at all nerved; corolla-teeth lance-deltoid, suberect; the throat turbinate. *m.*

m. Leaves ovate-oblong, 9–12 cm. long; stems soon subglabrate; heads 8 mm. high; involucral scales 5 mm. long; corolla-teeth about equaling the throat. . . . . 26. *M. Schultzii.*

m. Leaves ovate, 5–7 cm. long; stems permanently bristly with brown articulated spreading hairs; heads 6 mm. high; involucral scales 4 mm. long; corolla-teeth distinctly longer than the throat . . . . . 26a. *M. oreimeles.*

Mikania (§ **Racemosae**) **virgata**, spec. nov., herbacea perennis erecta stricta virgata 1 m. vel ultra alta infra inflorescentiam glabra; caule subtereti multicostulato ad 6 mm. crasso foliosissimo deinde basin versus delapsu foliorum denudato; internodiis 1–3.5 cm. longis; foliis inferne suboppositis superne disjunctim ternatis vel quaternatis late elliptico-obovatis obtusis vel apice rotundatis basi integris et angustatis aliter grosse crenato-dentatis plerisque 5-nerviis coriaceis utrinque viridibus subconcoloribus subtus atro-puncticulatis 4–5 cm. longis 2.5–3.2 cm. latis, nervis venisque utrinque paullo prominentibus; inflorescentia terminali pyramidata racemose paniculata 1–2.5 dm. alta 6–9 cm. diametro fulvo-puberula, ramis adscendentibus 3–8 cm. longis saepe ramosis; bracteis primariis subfoliaceis petiolatis secundariis multo reductis lanceolatis; pedicellis puberulis gracilibus 2–6 mm. longis apicem versus bracteolatis; involucri squamis oblanceolato-oblongis acuminatis 6 mm. longis 2 mm. latis brunneo-flavidis ciliolatis dorso glabris inconspicue 3-nervatis; corollis glabris albis, tubo proprio gracili cylindrico paullo basi expanso 2 mm. longo, faucibus campanulatis 1.6 mm. altis, dentibus limbi deltoideis 1.2 mm. longis; achaeniis prismaticis pentagonis 2 mm. longis in faciebus dense glanduliferis; pappi setis ca. 38 albis capillaribus barbellatis.—Brazil: on open hills at Barbacena, State of Minas Geraës, 13 Dec. 1921, *Prof. & Mrs. E. W. D. Holway*, no. 1395 (Gr.. U. S., N. Y.).

This highly characteristic species has strikingly the habit of some of the taller virgate Solidagos. It bears also habital similarity to

some of the Kanimias but has strictly 5-angled achenes. It appears to be near *M. subverticillata* Sch. Bip. (known to the writer only from Baker's original description in Mart. Fl. Bras. vi. pt. 2, 224), but that is said to be glabrous throughout and to have sessile heads, obtuse distinctly smaller involucral scales, and pinnately nerved leaves.

Brickellia gentianoides, spec. nov., herbacea perennis decumbens ubique glaberrima 2.5–3.5 dm. alta; caule tereti 3 mm. crasso; internodiis 1–5 cm. longis; foliis oppositis oblanceolatis vel (superioribus) lanceolato-linearibus plerumque obtusiusculis apice paullo callosis deorsum gradatim angustatis sessilibus integris vel saepius apicem versus utroque 2–4-crenato-dentatis 3–4 cm. longis 3–10 mm. latis 3-nerviis utrinque viridibus glaberrimis paullo carnosulis levissime basi connatis; corymbis trichotomis planis terminalibus; bracteis lineari-lanceolatis vel subulatis; capitulis ca. 21-floris 1 cm. altis ca. 7 mm. diametro pedicellatis; involucri turbinato-campanulati squamis ca. 20 anguste lanceolatis peracutis paullo rigidulis 3–4-seriatis 3-nerviis glabris obscure eroso-ciliolatis; receptaculo conico nudo; corollis 4–4.5 mm. longis; tubo proprio et faucibus vix distinguendis 3.7 mm. longis; dentibus limbi 5 ovato-dentoideis 0.7 mm. longis antheris apice cum appendice anguste deltoidea instructis basi paullo sagittatis; achaeniis 2.6 mm. longis glabris subaequaliter 9–10-costatis; pappi setis ca. 50 capillaribus flavescenti-albis vix scabratis. —Brazil: Rio Grande do Sul, *A. Saint-Hilaire* (journey of 1816–1821), no. 768, Cat. C², no. 2735 bis (Par., phot. Gr.).

On account of its evenly 9–10-ribbed achenes it becomes necessary to place this plant in the genus *Brickellia* rather than in *Eupatorium*. Its slightly sagittate anthers are anomalous (though not unprecendented) in either of these genera. The species would fall within the definition of *Brickellia* § *Bulbostylis* (see Robinson, Mem. Gray Herb. i. 24) but does not fit well into any of the hitherto recognized subsections.

Brickellia Kellermanii Greenman, Field Columb. Mus. Bot. Ser. ii. 265 (1907); Robinson, Mem. Gray Herb. i. 54, f. 32 (1917). A specimen collected in Guatemala by Friedrichsthal about the middle of the last century and cited without specific name by Hemsley, Biol. Cent.-Am. Bot. ii. 107 (1881) under no. 35, has been lent to the writer from the Royal Gardens at Kew for study and identification. It corresponds admirably with a photograph of the rare and little known *B. Kellermanii* except that the heads instead of being subsessile, as in the original plant (which may be called forma **typica**) are borne on slender pedicels. Rather wide variation in the length

of the pedicels is frequent in the genus and at least until other more convincing differences are found this plant of Friedrichsthal may be provisionally placed as

B. KELLERMANII, forma **podocephala**, forma nov., formae typicae simillima differt capitulis graciliter pedicellatis; pedicellis 3–10(–20) mm. longis erectis vel adscendentibus.—GUATEMALA: *Friedrichsthal* (K., phot. and fragm. Gr.).

II. STUDIES IN THE BORAGINACEAE.

BY I. M. JOHNSTON

1. RESTORATION OF THE GENUS HACKELIA.

As currently taken the genus *Lappula* is composed of two sharply differentiated groups. It is here proposed that the perennial and biennial species with pyramidal gynobase be segregated to form the genus *Hackelia*, while the annual species with subulate gynobase be left to constitute the genus *Lappula*. The very important characters which separate these very distinct genera may be realized by a study of the following contrast.

LAPPULA. Annual; inflorescence abundantly bracteate; pedicels erect; gynobase subulate, 5–10 times as tall as broad, about equaling the nutlets; style surpassing the nutlets; nutlets narrowly attached all along the well developed medial ventral keel.

HACKELIA. Biennial or perennial; inflorescence naked or rarely sparsely bracteate; pedicels recurved or deflexed in fruit; gynobase pyramidal, less tall than broad; style definitely surpassed by nutlets; nutlets attached by a large oblique submedial ovate or deltoid areola; ventral keel extending over only upper half of nutlet.

As usually taken *Lappula* has been an unnatural aggregate formed of two groups whose structures are so different that it seems improbable that the groups are immediately related. The species which I have refered to *Hackelia* do not find their nearest relations among the species of true *Lappula*, but rather among the species in section *Coloboma* of *Eritrichium*. Indeed so close and unmistakable are the relations between *Hackelia* and *Eritrichium* that with much justification the two genera might be merged. On the other hand *Hackelia* has been referred to *Lappula* only because the species in both genera have glochidiate bristles on the dorsal rim of the nutlets, and despite the fact that the species of the two groups differ markedly in habit and in a number of fundamental characters. As both *Lappula* and

Hackelia have in all probability evolved from the *Cynoglosseae* where glochidiate bristles are common as carpel appendages, it must be evident that the presence of barbed appendages is only of general phylogenetic significance and not a safe criterion upon which to judge immediate relationships.

Hackelia and *Lappula* differ in the manner by which the nutlets are attached to the gynobase. Among the borages this correctly has been considered of fundamental importance. In the characters of gynobase and nutlets *Hackelia* is almost exactly matched by developments in *Eritrichium* § *Coloboma*, for many species of that section approximate upon a reduced scale the characteristic habit of *Hackelia*, while furthermore some species, such as *E. strictum* Decne., *E. pectinatum* (Pall.) A.DC., etc., have the toothing on the dorsal margining of the nutlet tipped by subulate barbed prolongations.

Although approaching one another closely *Hackelia* and *Eritrichium* seem readily distinguished by habit, the former being rank-growing green biennials or perennials with broad thin leaves and stems 2–10 dm. high, whereas *Eritrichium* contains low, canescent or silvery, strongly rooted, caespitose plants with small firm leaves and stems 1–20 cm. high. The dorsal margining of the nutlets in *Hackelia* is usually broken up into flattened subulate glochidiate appendages, but in *Eritrichium* the margin is entire or merely dentate and usually without glochids. The only invariably diagnostic character by which the two genera can be separated is that found in the direction of the fruiting pedicels; in *Hackelia* the pedicels are recurved or reflexed in fruit whereas in *Eritrichium* they are always erect or nearly so. *Hackelia* centers in western North America and has outlying species in the Andes and Himalayas, and in central Europe, eastern United States, and Mexico. *Eritrichium* centers in Asia, but has an arctic series of species occurring at high latitudes or altitudes in Europe and North America.

The genus *Hackelia* was published for Opiz by Berchtold in the latter's "Oekonomisch-technische Flora Böhmens." The genus was separated from *Echinospermum* for reasons unstated, but evidently not because of the characters stressed now in resurrecting it, for although *H. deflexa* was the only species fully described under the genus, there were eight of Ledebour's species, all true Lappulas, referred to it in a footnote. The characteristic areola and attachment of the nutlets are described in the lengthy specific diagnosis of *H. deflexa*, but in the generic description the style and the attachment of the nutlets are described but vaguely, and in similar terms as in the

generic description of *Echinospermum* a few pages further on. *Hackelia deflexa* (Wahl.) Opiz, being the first species given under *Hackelia* and the only one treated with any detail, it is taken as constituting the type of the genus as here redefined. The species referable to *Hackelia* are as follows:—

Hackelia deflexa (Wahl.) Opiz in Bercht. Fl. Böhm. ii, pt. 2, 147 (1839). *Myosotis deflexa* Wahl. Vet. Acad. Handl. Stockholm, xxxi. 113, t. 4 (1810). *Echinospermum deflexum* Lehm. Asperif. i. 120 (1818). *Rochelia deflexa* R. & S. Syst. iv. 109 (1819). *Cynoglossum deflexum* Roth, Enum. i. 589 (1827). *Lappula deflexa* Greene, Pittonia ii. 182 (1891). *Echinospermum deflexum*, var. *americanum* Gray, Proc. Am. Acad. xvii. 224 (1882). *Lappula deflexa*, var. *americana* Greene, l. c. 183. *L. americana* Rydb. Bull. Torr. Cl. xxiv. 294 (1897).

✓ **H. virginiana** (L.), comb. nov. *Myosotis virginiana* L. Sp. Pl. 131 (1753). *Echinospermum virginicum* Lehm. Asperif. i. 117 (1818). *Rochelia virginiana* R. & S. Syst. iv. 108 (1819). *Lappula virginiana* Greene, Pittonia ii. 182 (1891). *Cynoglossum Morisoni* A.DC. Prodr. x. 155 (1846).

✓ **H. pinetorum** (Greene), comb. nov. *Echinospermum pinetorum* Greene in Gray, Proc. Am. Acad. xvii. 224 (1882). *Lappula pinetorum* Greene, Pittonia ii. 182 (1891). *L. pustulata* Macbr. Contr. Gray Herb. xlviii. 39 (1916). *L. heliocarpa* Brand in Fedde, Repert. xviii. 310 (1922).

H. Roylei (Wall.), comb. nov. *Cynoglossum Roylei* Wall. in Don, Gen. Syst. iv. 356 (1838). *C. laxum* Don, l. c. *Lappula laxa* Macbr. Proc. Am. Acad. li. 543 (1916). *C. uncinatum* Royle, acc. to Benth. in Royle, Ill. 305 (1839). *C. glochidiatum* Wall. acc. to Benth. in Royle, l. c. 306. *Echinospermum glochidiatum* A.DC. Prodr. x. 136 (1846). *Paracaryum glochidiatum* Benth. in Hook Fl. Brit. Ind. iv. 161 (1883). *L. glochidiata* Brand in Fedde, Repert. xiv. 146 (1915).

H. macrophylla (Brand), comb. nov. *Lappula macrophylla* Brand in Fedde, Repert. xiv. 147 (1915). *Cynoglossum uncinatum*, var. *laxiflora* Benth. in Royle, Ill. 305 (1839). *Echinospermum glochidiatum*, var. *laxiflorum* A.DC. Prodr. x. 136 (1846).—From their descriptions this and the next species seem scarcely distinct from the preceding one.

H. Dielsii (Brand), comb. nov. *Lappula Dielsii* Brand in Fedde, Repert. xiv. 147 (1915).

H. revoluta (R. & P.), comb. nov. *Cynoglossum revolutum* R. & P. Fl. Peruv. ii. 6 (1799). *Lappula revoluta* Brand in Fedde, Repert.

xiv. 148 (1915). *C. ovatifolium* Griesb. Götting. Abhandl. xxiv. 271 (1879). *L. revoluta*, f. *ovatifolia* Brand, l. c. *C. parviflorum* Krause, Engler Bot. Jahrb. xxxvii. 634 (1906). *C. Fiebrigii* Krause, l. c. *L. revoluta*, f. *Fiebrigii* Brand, l. c. *C. andicolum* Krause, l. c. 635.

H. costaricensis (Brand), comb. nov. *Lappula costaricensis* Brand in Fedde, Repert. xviii. 310 (1922). *L. guatemalensis* Brand, l. c. 311.

H. mexicana (Schl. & Cham.), comb. nov. *Cynoglossum mexicanum* Schl. & Cham. Linnaea v. 114 (1830). *Echinospermum mexicanum* Hemsl. Biol. Cent.-Am. Bot. ii. 377 (1882). *Lappula mexicanum* Greene, Pittonia ii. 182 (1891).—This and the preceding are closely related to *H. revoluta* and perhaps are not specifically distinct.

H. leptophylla (Rydb.), comb. nov. *Lappula leptophylla* Rydb. Mem. N. Y. Bot. Gard. i. 329 (1900). (?) *L. scaberrima* Piper, Bull. Torr. Cl. xxix. 545 (1902). (?) *L. angustata* Rydb. Bull. Torr. Cl. xxxi. 636 (1904). *L. Besseyi* Rydb. l. c. 636. (?) *L. grisea* Woot. & Standl. Contr. U. S. Nat. Herb. xvi. 164 (1913). *L. floribunda* of Piper (Bull. Torr. Cl. xxix. 537. 1902.) and other recent authors.

H. hispida (Gray), comb. nov. *Echinospermum diffusum*, var. *hispidum* Gray, Proc. Am. Acad. xvii. 225 (1882). *E. hispidum* Gray, l. c. xx. 259 (1884). *L. hispida* Greene, Pittonia ii. 182 (1891).

H. ciliata (Dougl.), comb. nov. *Cynoglossum ciliatum* Dougl. in Lehm. Pug. ii. 24 (1830). *Echinospermum ciliatum* Gray, Proc. Am. Acad. xvii. 225 (1882). *Lappula ciliata* Greene, Pittonia ii. 182 (1891).

H. setosa (Piper), comb. nov. *Lappula setosa* Piper, Bull. Torr. Cl. xxix. 544 (1902).

H. cinerea (Piper), comb. nov. *Lappula cinerea* Piper, Bull. Torr. Cl. xxix. 544 (1902).

H. ursina (Greene), comb. nov. *Echinospermum ursinum* Greene in Gray, Proc. Am. Acad. xvii. 224 (1882). *Lappula ursina* Greene, Pittonia ii. 182 (1891).

H. hirsuta (Woot. & Standl.), comb. nov. *Lappula hirsuta* Woot. & Standl. Contr. U. S. Nat. Herb. xvi. 164 (1913).

H. gracilenta (Eastw.), comb. nov. *Lappula gracilenta* Eastw. Bull. Torr. Cl. xxix. 523 (1902).

H. floribunda (Lehm.), comb. nov. *Echinospermum floribundum* Lehm. Pug. ii. 24 (1830). *Lappula floribunda* Greene, Pittonia ii. 182 (1891). *Rochelia patens* Nutt. Jour. Acad. Philad. vii. 44 (1834). *E. subdecumbens* Parry, Proc. Davenport Acad. i. 148 (1876). *L.*

subdecumbens Nels., Manual Rocky Mt. Bot. 412 (1909). (?) *L. leucantha* Greene, Leaflets i. 152 (1905). *L. Jessicae* McGreg. Bull. Torr. Cl. xxxvii. 262 (1910). *L. diffusa* of Piper and other recent authors.—The plant referred here has always been associated with Lehmann's *Echinospermum diffusum* despite the fact that it is perfectly portrayed in Hooker's, Fl. Bor. Am. ii. 84, t. 164 (1838), plate of *E. floribundum*, a plate apparently drawn from an isotype if not the actual type of that latter species. It is to be particularly noted that the plant, the *Lappula diffusa* of recent authors, which I refer to Lehmann's *Echinospermum floribundum* agrees with the pictured plant in perennial duration and in size of corolla, developments not present in *H. leptophylla*, the plant usually referred to Lehmann's species. In spite of the note by Nelson and Macbride, Bot. Gaz. lxi. 42 (1916), the account given by Parry, l. c., and the isotype preserved in the Gray Herbarium both clearly show that Gray, Proc. Am. Acad. xvii. 225 (1882), and Piper, Bull. Torr. Cl. xxix. 539 (1902), were correct in refering *Echinospermum subdecumbens* to the present species. The use of Parry's name in the Rocky Mountain Manual is incorrect! The plant is definitely blue-flowered, as the lack of mention of color in Parry's observations would suggest.

H. Eastwoodae, nom. nov. *Lappula micrantha* Eastw. Bull. Torr. Cl. xxx. 497 (1903); not *H. micrantha* (Ledeb.) Opiz.—Related to *H. floribunda*, but differing in small flowers and in having a few glochidiate prickles on the back of the nutlets. Perhaps only the Californian variety of that species.

H. bella (Macbr.), comb. nov. *Lappula bella* Macbr. Contr. Gray Herb. xlviii. 39 (1916). (?) *L. Rattanii* Brand in Fedde, Repert. xviii. 311 (1922).—Differing from the closely related *H. velutina* in possessing white corollas, and in having the back of the nutlets unarmed.

H. nervosa (Kell.), comb. nov. *Echinospermum nervosum* Kell. Proc. Calif. Acad. ii. 146, f. 42 (1862). *Lappula nervosa* Greene, Pittonia ii. 182 (1891).

H. velutina (Piper), comb. nov. *Lappula velutina* Piper, Bull. Torr. Cl. xxix. 546 (1902).—Perhaps only a good variety of the last. The Hackelias of the Yosemite Region seem best referred here although they vary as to pubescence and have small corollas with short tubes.

H. californica (Gray), comb. nov. *Echinospermum californicum* Gray, Proc. Am. Acad. xvii. 225 (1882). *Lappula californica* Piper, Bull. Torr. Cl. xxix. 546 (1902).

H. arida (Piper), comb. nov. *Lappula arida* Piper, Bull. Torr. Cl. xxviii. 44 (1901). *L. Cottoni* Piper, l. c. xxix. 549 (1902).

H. arida, var. **Cusickii** (Piper), comb. nov. *Lappula Cusickii* Piper, Bull. Torr. Cl. xxix. 542 (1902). *L. arida*, var. *Cusickii* Nels. & Macbr. Bot. Gaz. lxi. 41 (1916). *L. saxatilis* Piper, l. c. 541.

H. diffusa (Lehm.), comb. nov. *Echinospermum diffusum* Lehm. Pug. ii. 23 (1830). *Lappula diffusa* Greene, Pittonia ii. 182 (1891). *L. Hendersoni* Piper, Bull. Torr. Cl. xxix. 539 (1902). (?) *L. trachyphylla* Piper, l. c. 540. *L. subdecumbens* of Nels. Man. Rocky Mt. Bot. 412 (1909), as to description only.—The plant concerned here agrees with Lehmann's description in height of growth, pubescence, size and color of flowers, and in the arming of the nutlets. It fits the description far better than the other plant, here called *H. floribunda*, which has borne Lehmann's specific name in the past. In fact the present plant diverges from Lehmann's description only by having usually acutish rather than obtusish cauline leaves.

H. diffusa var. **caerulescens** (Rydb.), comb. nov. *Lappula caerulescens* Rydb. Mem. N. Y. Bot. Gard. i. 328 (1900). *L. subdecumbens caerulescens* Garrett, Fl. Wasatch Reg. 78 (1911).

2. The Genus Antiphytum.

In the literature concerned with the *Boraginaceae* the species of *Antiphytum* have been repeatedly confused with the species now referred to *Plagiobothrys*, *Cryptantha*, and allied genera, despite the fact that the former genus appears to belong not to the *Eritrichieae*, but rather to the *Lithospermeae*. This confusion has resulted from the attention being too closely centered upon similarities in nutlets, similarities which caused Gray, Proc. Am. Acad. xx. 265 (1885), to refer the Mexican species of *Antiphytum* to *Krynitzkia*, and which gave Macbride, Contr. Gray Herb. xlviii. 41 (1916), his reasons for saying that *Amblynotopsis*, here referred to *Antiphytum*, is "intermediate between the genera *Allocarya* and *Plagiobothrys*." The genus *Antiphytum*, however, differs from *Plagiobothrys* in habit, color of flowers, and particularly in the geminate stigmas. The stigmas of *Antiphytum* definitely remove it from the *Eritrichieae* in which *Plagiobothrys* and its other supposed allies are found.

The genus *Antiphytum* was first described in Meisner's Genera, i. 280 (1836–43). The original description, about fifty words in length, applies well to the genus as it has been taken in the past. In the Commentary accompanying his Genera, ii. 188 (1836–43), Meisner gives the bibliography of the genus as follows:—

"ANTIPHYTUM. DC. Mss. in Moç. ic. fl. Mex. ined. (4 sp.)—*Anchusa oppositifolia*, H.B.K., nov. gen. 3. p. 91. t. 200. *A. cruciata* et *stoechadifolia*, Cham. in Linnaea, 4. p. 438. et *A. Mexicana*, DC. ap. Moç. l. c.—Genus jam foliis oppositis (unde nomen) insigne."

Mociño's flora referred to was unpublished until 1874, or over thirty years after the appearance of Meisner's Genera. *Antiphytum mexicana* DC., published in the Prodromus, x. 121, in 1846, is *Heliotropium calcicola* Fernald, Proc. Am. Acad. xliii. 62 (1907). Although the only *Antiphytum* published in Mociño posthumous work, *A. mexicana* can scarcely be considered as the type of the genus since it remained so long unpublished and particularly since having typical *Heliotropium* fruit, it is not at all described in the original generic diagnosis. *Anchusa oppositifolia* HBK. is an *Allocarya*. This species being the first published species mentioned under *Antiphytum* and the only one with a cited illustration, might be considered the type of *Antiphytum* and that name treated as an older synonym of Greene's genus *Allocarya*, Pittonia i. 12 (1887). Usage, however, has restricted the name *Antiphytum* to the genus including Chamisso's *Anchusa cruciata* and *A. stoechadifolia*. This usage is justifiable by the workings of the logical process of residues, the other species originally placed in *Antiphytum* having been referred to other genera and the name *Antiphytum* left to that group which had a majority representation in the original definition of the genus. It is also to be noted that with the exception that they are never herbs, Chamisso's species agree with every item in Meisner's diagnosis. On the other hand *Anchusa oppositifolia* is never suffrutescent, and does not have scorpioid cymes, nor ciliate-papillose faucal protuberances.

In 1916 Macbride, l. c., erected the genus *Amblynotopsis* for the Mexican species which I refer to *Antiphytum*. Although four of the five recognized and previously published species had been at one time or another referred to *Antiphytum* no contrast was made between the members of the newly proposed genus and the old restricted one. A careful study of this relationship now shows that the Mexican plants, forming the genus *Amblynotopsis*, are distinguished from the Brazilian ones, forming the true *Antiphytum*, only by having non-blue corollas and alternate upper leaves. These are scarcely generic differences. The Mexican *Antiphytum heliotropioides* besides agreeing with the Brazilian *A. cruciatum* in shrubby habit and loose strigose pubescence of similar encrusted hairs, also has opposite leaves. The chief difference between the two plants being that in the Mexican plant the leaves of the inflorescence are alternate, whereas in the Brazilian

species the leaves are opposite throughout the plant. Among the Mexican species *A. floribundum* has all its leaves alternate. Such species as *A. peninsulare* and *A. nudicalces* have several pairs of opposite leaves. Hence within the enlarged *Antiphytum* there are all the stages from an entirely opposite-leaved condition to a completely alternate-leaved one. Since leaf-position has various degrees of development among the Mexican species and since the difference separating the Mexican and Brazilian species is simply a matter of slight degree it seems inadvisable to attempt the use of leaf-position as a generic character. Flower-color is equally unsatisfactory as a generic character. The Brazilian species have bluish flowers. Among the Mexican species *A. peninsulare* has white flowers, whereas the remainder have yellow ones. If the color of corolla is to be exalted to generic importance there will be need of three instead of merely two genera.

The Brazilian species have flat gynobases and nutlets that are basally attached by a short stipe-like prolongation. Although most Mexican specimens have their nutlets directly attached to a more or less pyramidal gynobase by a large oblique submedial ventral scar, certain specimens (*Palmer 443, 207*) here referred to the polymorphous *A. floribundum* have nutlets with basal attachments through a short stipe to a flattened gynobase quite like that exhibited in Brazilian specimens. A synopsis and bibliography of the genus follows:—

ANTIPHYTUM A.DC. in Meisner, Genera i. 280; ii. 188 (1836–43).
Thaumatocaryon Baill. Bull. Mens. Soc. Linn. Paris 839 (1890).
Amblynotopsis Macbr. Contr. Gray Herb. xlviii. 41 (1916).

Leaves all opposite; corolla bluish; South American.
  Plant herbaceous; leaves 10–35 mm. broad; nutlets smooth, shiny; corolla tubular-funnelform.....1. *A. tetraquetrum.*
  Plant suffrutescent; leaves 3–8 mm. broad; nutlets rugose, dull; corolla tubular-rotate.....2. *A. cruciatum.*
Leaves alternate at least above; corolla yellow or white; Mexican.
  Pedicels elongating, becoming 5–10 mm. long; leaves alternate only in the inflorescence; corolla with definite tube and faucal appendages.....3. *A. heliotropioides.*
  Pedicels not elongating, at most 5 mm. long; leaves in basal rosettes, alternate, or only lowermost opposite.
    Corolla subrotate, throat broad and open, tube practically undeveloped; appendages lacking, stamens exposed.
      Stems strictly erect, 3–8 dm. high; basal leaves few, oblanceolate to linear-oblanceolate, canescent, 3–10 mm. broad.....4. *A. floribundum.*
      Stems decumbent, less than 2 dm. tall; basal leaves numerous, crowded, very narrowly linear, silvery, 1–2 mm. broad.....5. *A. paniculatum.*

Corolla salverform, tube cylindrical and well developed; appendages well developed; stamens included and hidden.
Corolla white; fruiting calyx 8 mm. long, sparsely strigose-hispid; plant bushy, about 5 dm. tall....6. *A. peninsulare.*
Corolla yellow; fruiting calyx 2–5 mm. long, densely strigose; plant caespitose or with a prostrate shrubby caudex, 1–2 dm. high.
Plant with a loosely branched shrubby caudex; leaves not in basal rosettes, all cauline.... ....8. *A. nudicalces.*
Plant densely caespitose; basal leaves in dense rosettes.
Corolla about 5 mm. broad; style surpassing nutlets; fruiting calyx 3–4 mm. long.....7. *A. caespitosum.*
Corolla about 1 mm. broad; style not surpassing nutlets; fruiting calyx 2–3 mm. long.....9. *A. Parryi.*

1. ANTIPHYTUM TETRAQUETRUM (Cham.) A.DC. Prodr. x. 122 (1846). *Anchusa tetraquetra* Cham. Linnaea viii. 113 (1833). *Thaumatocaryon Hilarii* Baill. Bull. Mens. Soc. Linn. Paris 839 (1890). *Antiphytum Bornmülleri* Pilger in Fedde, Repert. iii. 24 (1906). *Antiphytum Bornmülleri*, var. *asperior* Pilger l. c. 25.

2. A. CRUCIATUM (Cham.) A.DC. Prodr. x. 121 (1846). *Anchusa cruciata* Cham. Linnaea iv. 438 (1829). *Anchusa stocchadifolia* Cham. l. c. 439. *Antiphytum stacchadifolium* A.DC. l. c. *Myosotis Berroi* Arech. Anal. Mus. Nac. Montevideo, ser. 2, i. 69, f. 5–6 (1911). —The lengthy descriptions given by Chamisso do not seem to contain any fundamental characters by which his two species can be distinguished, nor has any subsequent writer pointed out diagnostic characters.

3. A. HELIOTROPIOIDES A.DC. Prodr. x. 122 (1846). *Eritrichium heliotropioides* Torr. Bot. Mex. Bound. 140 (1859). *Krynitzkia heliotropioides* Gray, Proc. Am. Acad. xx. 265 (1885). *Cryptantha heliotropoides* Loes. in Fedde, Repert. xii. 243 (1913). *Amblynotopsis heliotropioides* Macbr. Contr. Gray Herb. xlviii. 41 (1916).

4. A FLORIBUNDUM (Torr.) Gray, Proc. Am. Acad. x. 55 (1875). *Eritrichium floribundum* Torr. Bot. Mex. Bound. 140 (1859). *Krynitzkia floribunda* Gray, l. c. xx. 265 (1885). *Amblynotopsis floribunda* Macbr. Contr. Gray Herb. xlviii. 41 (1916). *Amblynotopsis durangensis* Macbr. l. c. 42.—As here taken the species is extremely polymorphous and almost certainly capable of division, but at present the material is too meager to attempt satisfactory segregation.

5. **A. paniculatum**, nom. nov. *Lithospermum linifolium* Mart. & Gal. Bull. Acad. Belg. xi. 338 (1844); not *Antiphytum linifolium* A.DC. (1846).

6. **A. peninsulare** (Rose), comb. nov. *Krynitzkia peninsularis* Rose, Contr. U. S. Nat. Herb. i. 85 (1890). *Amblynotopsis peninsularis* Macbr. Contr. Gray Herb. xlviii. 41 (1916).

7. **A. caespitosum**, sp. nov., mexicanum; caulibus erectis vel valde ascendentibus 8–16 cm. altis apicem versus pauce stricteque ramosis; foliis dense strigosis argyro-canescentibus 1–2 mm. latis acutiusculis, inferioribus anguste linearibus 2–5 cm. longis erectis rosulatis, caulinis 8–15 mm. longis; racemis paucis unilateralibus manifeste bracteatis 2–3 cm. longis; calyce 2.5–3 mm. longo 5-partito breve pedicellato; corolla flava, limbo 4–5 mm. lato plano, lobis rotundatis imbricatis extus pubescentibus, tubo 1.5–2 mm. longo ad apicem cum 5 appendiculis gibbosis instructo, staminibus inclusis cum filamentis antheris brevioribus; nuculis rugoso-tuberculatis 1.5–2 mm. longis, areolis amplis distincte sub medio locatis; gynobasi angusta pyramidali; stylo nuculis longiore; stigmatibus geminatis.—MEXICO: Cerros near San Luis Tultitlanapa, Puebla, *Purpus 2606* (TYPE, Gray Herb.). Sonnige Kalkhügel bei Comitan, Chiapas, *Seler 3073*. Huauclilla, Nochixtlan, Oaxaca, *Conzatti & González 1222*.

8. **A. nudicalces**, sp. nov., diffusum; *A. caespitosum* similans sed differt ramis numerosis ramosis e caudice suffruticoso laxe ramoso prostrato vel etiam paullo subterraneo orientibus et foliis majoribus 2–3 mm. latis omnibus caulinis.—MEXICO: Sosola, alt. 7000 ft., Oaxaca, *L. C. Smith 393* (TYPE, Gray Herb.). Although differing from *A. caespitosum* conspicuously in habit this species is identical with it in inflorescence, floral, and fruit characters and may prove to be worthy of no more than varietal recognition.

9. A. PARRYI Wats. Proc. Am. Acad. xviii. 122 (1883). *Krynitzkia Parryi* Gray, Proc. Am. Acad. xx. 265 (1885). *Amblynotopsis Parryi* Macbr. Contr. Gray Herb. xlviii. 41 (1916).—MEXICO: En route from San Luis Potosi to San Antonio, Texas, *Parry* (TYPE). Sosola, Oaxaca, *L. C. Smith 394*. Without locality, *Coulter 1050* in part. The type is in advanced maturity and entirely lacks flowers. It is associated with the small-flowered Oaxacan plant only because of the remarkable similarity in the size and developments of all other parts.

3. NOVELTIES AND NEW COMBINATIONS IN THE GENUS CRYPTANTHA.

Cryptantha Abramsii, sp. nov., annua basem versus simplex supra sparse ascendenter ramosa 15–30 cm. alta strigosa; foliis linearibus vel lineari-filiformibus 1–3 cm. longis 1–1.5 mm. latis sessilibus acutiusculis basem versus hispidis, infimis oppositis; spicis solitariis vel geminatis 2.5–10 cm. longis conspicue bracteatis, bracteis linearibus vel lanceolatis; corolla evidenti 1.5–2 mm. lata; calycibus maturitate 3–4 mm. longis remotis non biseriatis strictis vel ascendentibus, lobis lanceolatis breviter hispidis calyce ⅓–¼ brevioribus

abaxillaribus crassissimis et hispidissimis; nuculis 1–4 lanceolatis laevibus nitidis basi truncatis compressis 2–2.2 mm. longis, sulcis clausis basem versus furcatis; stylo alto ⅓–¼ nuculis breviori; gynobasi subulata.—CALIFORNIA: San Pedro Hills near Malaga Cove, Los Angeles Co., March 14, 1903, *Abrams 3139* (TYPE, Gray Herb.; ISOTYPE, Univ. Calif. Herb.). Allied to *Cryptantha leiocarpa* (F. & M.) Greene, but differing from that species in its short style, erect habit, and fewer nutlets. It suggests the large-flowered forms of *C. Clevelandi* Greene, and possibly may be only a bracteate form of the latter species. Further material is a great desideratum.

Cryptantha Brandegei, sp. nov., annua diffusa decumbens; caulibus gracilibus 1–4 dm. longis strigosis pustulatis vel levibus; foliis oblongo-lanceolatis vel linearibus obtusis 6–15 mm. longis 2–3(–4) mm. latis basem versus sparse hispidis concoloribus; spicis solitariis vel rare geminatis aliquid sparse bracteatis vetustis 4–8 cm. longis; calycibus maturitate congestis vel remotis 2–4 mm. longis strictis; lobis calycis linearibus costatis cum setis flavescentibus horrentissimis marginibus sparse strigosis abaxillaribus longissimis hispidissimis; corolla parva minus quam 1 mm. lata; nuculis 1–4 laevibus 1.5–2 mm. lanceolatis nitidis basi truncatis, sulcis clausis basem versus furcatis; stylo alto nuculis ⅓–⅕ breviori; gynobasi subulata.—CALIFORNIA: Santa Rosa Island, June 1888, *T. S. Brandegee* (TYPE, Gray Herb.; ISOTYPE, Univ. Calif. Herb.). This is an ally of *Cryptantha leiocarpa* (F. & M.) Greene, from which it differs in its southern island occurence, greater range in nutlet-number, and particularly in its shorter style. It suggests phases of the polymorphous *C. Clevelandi* Greene, but is readily told from that species by its bracteate inflorescence and slightly longer style. *Cryptantha Brandegei* is to be distinguished from *C. Abramsii* by its smaller corolla and diffuse spreading habit.

Cryptantha albida (HBK.), comb. nov. *Myosotis albida* HBK. Nov. Gen. et Sp. iii. 91 (Aug. 1818). *Lithospermum ramosum* Lehm. Asperif. ii. 328 (Nov. or Dec. 1818). *Eritrichium ramosum* A.DC. Prodr. x. 132 (1846). *Krynitzkia ramosa* Gray, Proc. Am. Acad. xx. 274 (1885). *Cryptanthe ramosa* Greene, Pittonia i. 115 (1887). *Eritrichium hispidum* Buckley, Proc. Acad. Philad. 1861, 462 (1861). (?) *Krynitzkia mexicana* Brandg. Zoe v. 182 (1904).—Information kindly supplied me by Dr. J. H. Barnhart of the New York Botanical Garden has given the reason for reviving the long neglected *Myosotis albida* HBK. This name was published in the ninth part of the Nova Genera which, according to Dr. Barnhart, appeared probably

late in August 1818 since it was noted under the date of October 3, 1818 in the Bibliographie de la France, a work in which the appearance of books was usually announced about six weeks after their actual publication. The first part of Lehmann's Asperifoliae appeared before the ninth part of the Nova Genera and its priority was recognized by Kunth, Flora i. 601 (1818) and Nov. Gen. et Sp. iii. 451 (1820). When the first part of the Asperifoliae was reviewed in Flora, i. 501, under the date October 30, 1818, it was accompanied by the statement "Der zweyte Theil ist unter der Presse" which would seem to indicate that the second part of Lehmann's work did not appear for at least two months after the ninth part of the Nova Genera. The second part of the Asperifoliae may have appeared in November or December but at present there seems no way of telling whether it actually did appear before the end of 1818, the year given on the title page.

Cryptantha falcata (Hieron.), comb. nov. *Eritrichium falcatum* Hieron. Bol. Acad. Córdoba iv. pt. 1, 64 (1882).

Cryptantha patagonica (Speg.), comb. nov. *Amsinckia patagonica* Speg. Anal. Soc. Cient. Argent. liii. 137 (1902).

Cryptantha Spegazzinii, nom. nov. *Amsinckia angustifolia*, var. *microcarpa* Speg. Anal. Soc. Cient. Argent. liii. 136 (1902).—The nutlets described by Spegazzini are evidently not those of an *Amsinckia*. I am associating with this name a specimen from near General Roco, Rio Negro, *Fischer 131*, although the plant has the corolla and calyx subequal and not "corollae . . . calyce duplo longioris."

Cryptantha granulosa (R. & P.), comb. nov. *Myosotis granulosa* R. & P. Fl. Peruv. ii. 5 (1799).

Cryptantha corymbosa (R. & P.), comb. nov. *Myosotis corymbosa* R. & P. Fl. Peruv. ii. 5 (1799).

In 1887 Greene, Pittonia i. 58–60, proposed the genus *Eremocarya* and reëstablished Torrey's *Piptocalyx*. Since that time the two genera have received almost universal acceptance despite the fact that they appear to lack fundamental characters and much resemble members of the genus *Cryptantha*. The nutlets found in *Eremocarya* and *Piptocalyx* are indistinguishable from those of *Cryptantha*, being of similar shape, possessing similar markings, and having a very similar groove. The gynobase also is much the same in all three genera. In fact, *Eremocarya* and *Piptocalyx* seem merely well marked species of *Cryptantha* and are consequently referred to *Cryptantha* where their species can be disposed of as follows:—

Cryptantha § Piptocalyx. *Piptocalyx* Torr. in Wats. Bot. King Exped. 240 (1871); not Oliver (1870). *Krynitzkia* Subsect. *Piptocalyx* Gray, Proc. Am. Acad. xx. 275 (1885). *Krynitzkia* Sect. *Piptocalyx* Greene, Bull. Calif. Acad. i. 206 (1885). *Greeneocharis* Gürke & Harms in E. & P. Nat. Pflanzenf., Gesamtreg. 462 (1899). *Wheelerella* Grant, Bull. So. Calif. Acad. v. 28 (1906).—This section of *Cryptantha* is characterized by its peculiar circumscissile calyx which is tubular to above the middle and has its lobes practically unribbed. A short distance below the sinuses the calyx-tube suddenly changes, at the line of dehiscence, from firm siliceous-hyaline to herbaceous. In the characters of its calyx the plants much resemble certain species of *Plagiobothrys*. Among the suggested generic characters of *Piptocalyx*, Greene especially stressed its possession of persistent pedicels although that development is present in such Cryptanthas as *C. albida*, *C. racemosa*, *C. holoptera*, and *C. pterocarya*. The character most emphasized by Greene, however, was the dichotomy of *Piptocalyx*. Unfortunately this character also fails since unmistakable and very similar dichotomy occurs in such species as *Cryptantha recurvata* and *C. micromeres*. The only distinctive character possessed by *Piptocalyx* is its circumscissile calyx. This development, however, is both present and absent in the closely related genus *Plagiobothrys* and there seems no particular reason why in the present case the character should be considered of generic value. The following two species are recognized..

Cryptantha circumscissa (H. & A.), comb. nov. *Lithospermum circumscissum* H. & A. Bot. Beech. 370 (1840). *Piptocalyx circumscissus* Torr. in Wats. Bot. King. Exped. 240. (1871). *Eritrichium circumscissum* Gray, Proc. Am. Acad. x. 58 (1874). *Krynitzkia circumscissa* Gray, l. c. xx. 275 (1885). *Wheelerella circumscissa* Grant, Bull. So. Calif. Acad. v. 28 (1906). *Greeneocharis circumscissa* Rydb. Bull. Torr. Cl. xxxvi. 677 (1909). *Cryptanthe depressa* Nels. Bot. Gaz. xxxiv. 29 (1902).

Cryptantha dichotoma (Greene), comb. nov. *Krynitzkia dichotoma* Greene, Bull. Calif. Acad. i. 206 (1885). *Piptocalyx dichotomus* Greene, Pittonia i. 60 (1887). *Wheelerella dichotoma* Grant. Bull. So. Calif. Acad. v. 28 (1906). *Greeneocharis dichotoma* Macbr. Proc. Am. Acad. li. 546 (1916). *G. circumscissa*, var. *hispida* Macbr. l. c.—Macbride's variety of *G. circumscissa* is evidently a reduced montane form of *C. dichotoma* which simulates *C. circumscissa* in gross aspect. It makes it impossible to use robustness as a distinguishing character between *C. dichotoma* and *C. circumscissa*, and leaves pubescence as the only differentiating character.

According to Greene, Pittonia i. 56 (1887), "*Eremocarya* is most excellently marked in a three-fold way by its racemes" which are biserial and very dense, conspicuously bracteate, and repeatedly dichotomous. Neither singly nor in combination do these characters distinguish *Eremocarya* from *Cryptantha*. Almost every species of *Cryptantha* has its flowers somewhat biserial. In *Cryptantha Grayi*, *C. albida*, *C. pusilla*, *C. maritima*, etc., particularly dense biserial racemes may be found. Dichotomy is also frequently present in *Cryptantha* and is quite unmistakable in *C. albida*. Bracteate racemes are well developed in *C. maritima*, *C. leiocarpa*, *C. albida*, etc. Also emphasized by Greene was the dye-secreting tissue of *Eremocarya*. Following him most recent authors have dignified that development by treating it as the crucial generic character. In *Plagiobothrys*, even as limited by Greene, there are species with dye-secreting tissue and those without. This example would give precedent for including dye-secreting and non-dye-secreting species within the same genus, even were there no recognized case of dye-secretion among the indubitable species of *Cryptantha*. Dye-secretions in the roots are not uncommon in *Cryptantha* and in the Gray Herbarium are found present in specimens of such distinct species as *C. Fendleri* (*Osterhout 3425*, *Patterson 112*, *Baker 780*) and *C. muricata* (*Parish 929*). During 1921 I collected on the islands of the Gulf of California a yet unpublished variety of *C. Grayi* which has its roots as heavily charged with purple dye as do the most characteristic specimens of *Eremocarya*. In addition to the above characters, which are evidently insufficient to justify generic segregation, Greene gave *Eremocarya* as having "a persistent open calyx and an enlarged persistent style." The persistent open calyx of *Eremocarya* is well matched in *C. holoptera* and in *C. albida*, while in what Greene calls an "enlarged persistent style" *Eremocarya* is indistinguishable from the several species allied to true *C. muricata*. A careful study of *Eremocarya* has failed to reveal characters other than those unsatisfactory ones enumerated by its author and I am consequently forced to the conviction that Greene's genus is unworthy of recognition even as a section. Accordingly the following species and variety are referred to *Cryptantha* where they fit naturally into the same group of species as *C. Grayi* and and *C. angustifolia*.

Cryptantha micrantha (Torr.), comb. nov. *Eritrichium micranthum* Torr. Bot. Mex. Bound. 141 (1859). *Krynitzkia micrantha* Gray, Proc. Am. Acad. xx. 275 (1885). *Eremocarya micrantha* Greene, Pittonia i. 59 (1887). *Eremocarya muricata* Rydb. Bull. Torr. Cl. xxxvi. 677 (1909).

Cryptantha micrantha, var. **lepida** (Gray), comb. nov. *Eritrichium micranthum*, var. *lepidum* Gray, Synop. Fl. N. A. ii. pt. 1, 193 (1878). *Krynitzkia micrantha*, var. *lepida* Gray, Proc. Am. Acad. xx. 275 (1885). *Eremocarya lepida* Greene, Pittonia i. 59 (1887). *Eremocarya micrantha*, var. *lepida* Macbr. Proc. Am. Acad. li. 545 (1916).

4. A Synopsis and Redefinition of the Genus Plagiobothrys.

In 1835 the name *Plagiobothrys* was originally used by Fischer and Meyer for what then appeared to be a monotypic Chilean genus. The first species, *P. fulvus*, was separated from *Eritrichium* because of the peculiar annular scar on its nutlets. In 1874 Gray, Proc. Am. Acad. x. 57, reduced *Plagiobothrys* to a section under *Eritrichium* and placed in the section besides the original species five others which lacked annular scars on the nutlets. *Plagiobothrys* was reëstablished by Gray, Proc. Am. Acad. xx. 281, in 1885 when he amplified it to include fourteen species, five of which were placed in a newly erected section, and nine of which were put in his section *Genuini*, a group coëxtensive with his *Eritrichium* § *Plagiobothrys* of 1874.

Gray, Proc. Am. Acad. xi. 89, founded the genus *Echidiocarya* in 1876, and at that time included in it only the anomalous *E. arizonica* (*P. Pringlei* Greene). The character for the genus was found in the long-stiped nutlets. In 1877, Proc. Am. Acad. xii. 163, the genus was enlarged so as to include the newly described and obviously related *E. californica*. A third member of the group was added in 1883, Proc. Am. Acad. xix. 90, when Gray described *P. ursinus* and noted that, "The comparatively recent discovery of the preceding species [*P. ursinus*] of this section has made it clear that both of them should fall into *Plagiobothrys*, . . ." As a result of the transfer *Echidiocarya* was reduced to its original species and characterized by its "conspicuously stipitate" nutlets. In 1887 Greene, Pittonia i. 9 & 21, argued the artificiality of this latter concept and transferred to *Plagiobothrys* the remaining and type species of *Echidiocarya* saying that it had "every aspect and every character of *Plagiobothrys*, except that there is a stipe between the scar, or point of attachment to the gynobase, and the body of the nutlet." Greene's disposal of *Echidiocarya* has remained unchallenged.

Anyone who will study Gray's *Echidiocarya arizonica*, *E. californica*, and *Plagiobothrys ursinus* can not help appreciating the close relations between those species and the naturalness of *Echidiocarya* in its broadest sense, for the species agree not only in gross aspect, but in

scores of important and unimportant minute details as well. The fruit, though varying somewhat in the development of the stipe-like base, is similar in form and marking. Furthermore there is a strong similarity among the three species as regards calyx and corolla. None of the species have obvious relations within *Plagiobothrys* as that genus is currently taken. The three are sharply set off from it by their lack of a conspicuous caruncular scar on the nutlets and by their bearing the scar on a stipe projected above the ventral keel and not in a broad shallow transverse groove below the level of the keel. In fact *Echidiocarya* is not a part of *Plagiobothrys*, as that genus is usually taken, but belongs rather to the group which Greene named *Allocarya*. This latter relation is indicated by the occurence of lower opposite leaves in all three species. Significant also is the fact that the habit of *Echidiocarya* is approached by various species of *Allocarya*, and its nutlet-form simulated by the fruit of *Allocarya australasica*. The species of *Echidiocarya* seem clearly congeneric with those of *Allocarya*, and since Gray's generic name is about ten years older than that of Greene the concept commonly called *Allocarya* will have to be called *Echidiocarya* if it be actually worthy of generic recognition.

The genus *Somnea* was proposed by Greene, Pittonia i. 22, in 1887. It consists of two quite distinct and apparently not immediately related elements. The typical section of *Somnea* contains the species which Gray called *Plagiobothrys glomeratus* and *P. hispidus*, and placed in the specially formed *Plagiobothrys* § *Hypsoula*. This group differs from all others of *Plagiobothrys* in its glomerate inflorescence, rough hispid pubescence, and supramedial caruncular scar. Although the group is a natural one and is fairly well marked, the form and structure of its nutlets reveal such unmistakable relations with *Plagiobothrys* that it seems best to consider it a member of that genus as most recent authors have been content to do. The fragile nature of the caruncle, particularly emphasized by Greene, is not positive nor capable of exact definition. It is not worthy of particular note and is certainly not of generic value.

The second section of *Somnea* is composed of three species falling under what Gray, Proc. Am. Acad. xx. 281, in 1885 indicated as *Plagiobothrys* * *Ambigui*. These species differ from those in genuine *Plagiobothrys* by having a coarse hispid pubescence and nutlets which superficially closely simulate the nutlets of *Amsinckia*. There is little in common between the species of the second section of *Somnea* and those of the first and typical section, apparently the most important agreement being in the coarse hispid pubescence. Greene

attributed to the second section a fragile caruncular scar similar to that in the typical section, but this attribute I am utterly unable to appreciate. The second section has a peculiar and characteristic nutlet development. The nutlets have a submedial scar that is borne, not at or below the lower end of the ventral keel, but surrounded by and wedged in between the pericarpial margins that form the keel and consequently appearing at first glance as if borne upon it. The striking nutlet difference seems of funamental importance and were other important concomitant characters forthcoming I should feel that the group merits generic recognition. The problem deserves further study and for the present I am following current usage and referring the group to *Plagiobothrys* where it can form a new section which may appropriately be called **Amsinckiopsis**.

The genus *Allocarya* was erected by Greene, Pittonia i. 10–12, in 1887. In proposing the genus Greene argued that its species "agree admirably in that best mark of a good and natural genus, the habit" and that they possessed "a character very rare in the order, if not indeed unique, that of the lower leaves being not only opposite, but distinctly connate-perfoliate." He states further that "*Allocarya* is, in truth, much more nearly allied to *Plagiobothrys* than to *Krynitzkia* [*Cryptantha*]. Its nutlets are in general, not very different, being rugose, keeled more or less both dorsally and ventrally, and showing distinct lateral angles." Since its proposal *Allocarya* has been universally accepted in manuals and floras of western United States. The presence of opposite leaves in its species has been taken as the crucial character. Piper, Contr. U. S. Nat. Herb. xxii. 79 (1920), in his detailed "Study of Allocarya" speaks generally of the genus as follows,—"The genus as delimited by Greene has been generally accepted as valid. It is best distinguished from allied genera by the ventrally keeled nutlets, which are attached basally or suprabasally to a low gynobase, and by having the lowermost leaves opposite." Recently Macbride, Contr. Gray Herb. lix. 34 (1919), wrote, apropos of the reduction of *Allocarya* to *Lappula*, as follows:—"*Allocarya* is most closely related to *Plagiobothrys* and if Mr. Druce had referred his plant to the latter genus some well-taken arguments for his action could be presented. These genera also, however, are nicely distinct although in nutlet-characters they approach each other closely. The attachment of the nutlets of *Plagiobothrys* is nearly or quite medial rather than basal or supra-basal and the leaves are never opposite as are the lower ones of *Allocarya*. The fact that both genera contain numerous species none of which fail in any degree to conform to the

generic character in each case is the best argument to my mind as to the validity of those genera." Summing up the above paragraph it may be said that *Allocarya* deserves generic recognition because of its naturalness, this evidenced by its universal acceptance, and because of the constancy and generic value of its habit, the attachment of its nutlets, and its opposite leaves.

Allocarya is said to have a characteristic habit, but at least this is not evident upon a comparison of species so diverse in appearance as *A. mollis, A. Scouleri, A. Greenei, A. humistrata, A. californica,* and *A. stricta.* Not only do the species present quite different habits, but they are closely simulated by species commonly referred to *Plagiobothrys.* For example in gross aspect *A. mollis* is strikingly like southern forms of *P. canescens; A. Greenei* and *A. Scouleri* suggest *P. fulvus* and *P. nothofulvus,* while *A. scopulorum* and *A. Cooperi* simulate forms of *P. californicus.* It can be positively said that the species of *Allocarya* do not have a common and distinctive aspect, and furthermore that they are not as a group habitally distinct from *Plagiobothrys.*

The attachment of the nutlet is not distinctive of *Allocarya.* This is at once evident upon a comparison of the fruit of *A. Greenei* with that of *P. fulvus,* for in these species there is a remarkable agreement in size and shape of the nutlets and in the arrangement of keels and ridges upon them. Most striking of all is the occurrence in both species of similarly placed, very similar excavated scars. A Patagonian *Allocarya* described further along in this paper has nutlets closely approximating in both form and attachment those of *P. Torreyi.* The nutlets of *P. Torreyi* are also suggested by those of *A. mollis. Allocarya* does present extremes in fruit developments such as the elongate lance-like basally attached nutlets of *A. stipitata* and allies, but these are but culminations of tendencies which intermediate developments bring very close to the conditions present in various species of *Plagiobothrys.*

It would seem that the claims of *Allocarya* for generic recognition must rest upon the occurrence of opposite leaves on its species. This condition seems to have been at least vaguely realized by the authors who have maintained the genus, for in every keyed or descriptive account of the group the presence of opposite leaves has been given as its crucial character. What has not been realized, however, is that opposite leaves are not particularly characteristic of *Allocarya,* the development being quite evident and exactly similar in mature plants of *Cryptantha rostellata* and *C. affinis,* as well as in the younger stages

of most other species of *Cryptantha*. Furthermore the character is well developed and very obvious in *P. Pringlei* and in most (not all) specimens of *P. californicus*. *Allocarya Greenei* shows unmistakable relationships with *P. fulvus* and is probably the nearest relative of that species, yet because it has opposite lower leaves it is forthwith put into another genus. This species alone seems a good argument against the genus *Allocarya*. It should also be realized that opposite leaves occur in varying abundance in the several species of *Allocarya*, some having all the leaves opposite, others having a less large proportion or only the lowest pair opposite. In other words there seems to be a complete set of intermediate stages which connect up morphologically the completely opposite-leaved Allocaryas with the completely alternate-leaved *Plagiobothrys*. In the light of the unquestionably close relation between *Allocarya* and *Plagiobothrys*, and the varying proportion of opposite leaves in the species of *Allocarya*, it is most evident that the use of opposite leaves as a generic criterion is arbitrary and that the currently accepted line of cleavage between the genera is neither a profound nor a particularly natural one. Summing up the present paragraph it can be said that opposite leaves are considered a poor diagnostic character in the present instance because they are present or absent in certain species of *Plagiobothrys*, and because their absence in *Plagiobothrys* seems but the culmination (or the beginning) of the variable quantitative development of the character in *Allocarya*.

Although much stress has been placed on the fact that *Allocarya* has remained unchallanged since its promulgation over thirty years ago, the fact is significant only as it shows the lack of study of generic relations within the eritrichioid borages. The genus may have had wide acceptance, but it has not had repeated critical reconsiderations. The last critical study of the generic lines of the group was by Greene. Greene's grasp of the relations and characters of the western American eritrichioid borages is undeniable, but unfortunately his subdivisions within the borages, as in many other families, represent intergrading or scarcely distinct groups which seem better treated as sections or subgenera.

Plagiobothrys can not be separated from *Allocarya*, *Echidiocarya*, and *Sonnea* by developments possessed by the latter genera, and neither can it be distinguished from the enumerated genera by peculiar structures of its own. The character usually given as generically diagnostic for *Plagiobothrys* is the occurrence of a "caruncular scar" upon its nutlets. However, this character is probably best

developed in *Sonnea glomerata* and *S. hispida*, and is present although weakly developed in *Allocarya Scouleri* and in the Patagonian *Allocarya* described in this paper. In *A. Greenei* the character fails completely, for the scar in that species is essentially the same as the scar in *P. fulvus*. Although it can be said that the caruncular scar reaches a high development in *Plagiobothrys*, it can not be said that it characterizes the genus or reaches its greatest development there.

Although not previously pointed out, the species of true *Plagiobothrys* are fairly well characterized by the position of the scar. In *Plagiobothrys* the nutlet-scar is in a broad shallow transverse groove, and distinct from the ventral keel and below the level of it. In *Allocarya* and *Echidiocarya* the scar is usually contiguous with the ventral keel and either flush with it or projected from it on a stipe-like base. As with most other characters its universality is destroyed by *Allocarya Greenei*, that species which is an *Allocarya* only in its lower leaves.

Because of the lack of consistently diagnostic characters which would separate them, *Allocarya*, *Echidiocarya*, and *Sonnea* are all merged with *Plagiobothrys*. The result is a genus which appears to be a very natural one, and one which admits of great precision in definition. The amplified *Plagiobothrys* is at once distinguished from its nearest relatives, *Cryptantha* and *Oreocarya*, by the lack of a pronounced longitudinal ventral groove, and the possession instead of a well developed ventral keel and a definitely circumscribed small scar. The gynobase is a pyramid or low frustum and very much shorter than the nutlets, and is not subulate and about equalling the nutlets as in *Cryptantha* and *Oreocarya*. The nutlets in *Plagiobothrys* are commonly keeled and usually rugose, whereas in *Cryptantha* and *Oreocarya* they are rarely if ever keeled and the roughenings usually tuberculate or muricate. The pubescence in *Plagiobothrys* is mostly appressed and is less stiffly spreading than is the hispid indument characteristic of *Cryptantha*.

In order intelligently to select the specific names which should be transferred to *Plagiobothrys* it has been necessary to go into the intrageneric classification. As a result of this study and with the hope that it will give the paper a wider usefulness I have included a rough key to the accepted species. It is not pretended that the present paper supplies a finished study of the specific classification, but rather only a hastily prepared conservative synopsis which I hope may be preliminary to a future detailed descriptive account. Although it seems certain that future detailed work would cause the

reduction of some of the species here recognized, it is believed that the equally certain recognition of species here reduced will keep the total number of recognized species about as here given. The chief result of a protracted study would be the clarifying of specific lines and the naming and classifying of the abundant intraspecific variation.

During the preparation of this paper I have had Professor Piper's "Study of Allocarya" continually at hand, and have given his suggested classification a careful study. His treatment is based almost entirely upon the shape, sculpturing, and attachment of the nutlets; characters upon which he comments as follows:—"The nutlet characters seem remarkably constant, and in mixed gatherings serve perfectly to segregate the species. Relying on the constancy of the nutlet characters in particular, it is necessary to recognize additional species." The number of recognized species was increased from eighteen to seventy-nine. Although Piper's revision is based upon a wealth of material and shows every evidence of a patient and prolonged investigation I find that I am unable to follow it since I differ from its author in a fundamental point; *i.e.* I believe that the sculpturing and markings of the nutlets in *Allocarya* had best be considered excessively variable and consequently of minor if of any importance in the characterization of species. I am led to believe as I do because surprisingly numerous nutlet variations may be discovered in very small areas among plants remarkably uniform in aspect and in all other characters save those of nutlets. Piper has taken the nutlets as constant and has practically disregarded all other characters, whereas I have felt that a paralleling of several vegetative characters were more important than the variation of a single fruiting structure. The nutlet variations of *Allocarya* have been patiently worked out by Piper and named as species. These minute, very numerous microscopic species appear unpractical and seem justifiable only if they greatly increase the precision in identification and result in a more natural classification. Unfortunately even after considerable familiarity with his key to the numerous species I find it difficult to name plants satisfactorily according to Professor Piper's treatment, and I am compelled to believe that the minute nutlet sculpturings merely appear constant because their great arc of variation has been broken up and specific names associated with very short segments of variation. Though the classification seems carried to an unpractical extreme I would be glad to accept it were it clearly natural. Distribution, I feel, supplies one of the best tests of the naturalness of a species. By the disregard which Piper's species show for the principles underlying

Jordan's Law, Science n. s. xxii. 547 (1905), I feel forced to consider them, in a large part, to be unnatural entities. It is highly significant that by largely disregarding nutlet characters and basing species upon obvious external characters that a classification can be made which does not place closely related species together in the same small area. The four species of *Allocarya* recently published by Brand, Fedde Repert. xviii. 312 (1922), should also make one realize that the acceptance of species based upon unit nutlet characters will undoubtedly lead to the further multiplication of species, for future collecting is bound to turn up unnamed developments and a more careful examination of Piper's specimens is certain to reveal unnamed variations. This will soon make *Allocarya* one of those genera that are overdivided and hopelessly snarled, and one in which an identification is but rarely attempted—then only with a sigh—and never accomplished with either expedition or with confidence.

PLAGIOBOTHRYS F. & M. Ind. Sem. Hort. Petrop. ii. 46 (1835). *Echidiocarya* Gray, Proc. Am. Acad. xi. 89 (1876). *Sonnea* Greene, Pittonia i. 22 (1887). *Allocarya* Greene, Pittonia i. 12 (1887).

KEY TO SPECIES.

Leaves all alternate.
Caruncle of nutlet elongate, apparently extending along crest of ventral keel; nutlets trigonous, *Amsinckia*-like. § *Amsinckiopsis*.
Nutlets irregularly rugose; corolla 4–7 mm. broad.
Inflorescence elongated, loosely flowered; plant 1–4 dm. high. . . . . 1. *P. Kingii*.
Inflorescence glomerate or scarcely elongated, congested; plant 5–15 cm. tall. . . . . 2. *P. Harknessii*.
Nutlets conspicuously tessellate; corolla 1–2.5 mm. broad. 3. *P. Jonesii*.
Caruncle ovate or orbicular, at or below end of ventral keel.
Caruncle weakly developed, borne at tip of a short ventral stipe; nutlets lacking a broad transverse ventral groove. . . . . 16. *P. californicus*.
Caruncle well developed, sessile on nutlet, in a broad shallow transverse ventral groove.
Inflorescence glomerate; caruncle fragile, at or above the middle of nutlet; basal leaves lacking at maturity of plant. § *Sonnea*.
Nutlets dark, dull, conspicuously rugose and tuberculate, 1–2.3 mm. long. . . . . 4. *P. hispidus*.
Nutlets light colored, somewhat shiny, nearly smooth, 2.5–3 mm. long. . . . . 5. *P. glomeratus*.
Inflorescence elongate, racemose; caruncle cartilaginous, at or below middle of nutlet; basal leaves evident at maturity of plant. § *Euplagiobothrys*.
Calyx circumscissile in fruit, less than 4 mm. long; lobes usually connivent over fruit; usually only 1–2 nutlets developing.
Inflorescence a long simple bracteate raceme; stems usually about 2 dm. long, ascending,

hispid, branched mainly below middle; nutlets highly arched in lateral outline, 1–2.5 mm. long; corolla 3 mm. broad ..... 7. *P. arizonicus.*

Inflorescence furcate, bracteate only at base if at all; stems strictly erect, about 3.5 mm. high, appressed hispid-villous, branched only above middle if at all; nutlets low and flattened in lateral outline, 2–3 mm. long; corolla 3–9 mm. broad..... 6. *P. nothofulvus.*

Calyx not circumscissile or if so the strongly accrescent calyx over 4 mm. in length; calyx-lobes erect or spreading; 4 nutlets usually developing.

Nutlets with a conspicuous annular caruncle, 2.3–3.3 mm. long; calyx cleft to near base, fulvescent; corolla-tube slightly exceeding calyx..... 8. *P. fulvus.*

Nutlets with solid caruncle, less than 2.3 mm. long; calyx cleft ⅔ to base.

Transverse dorsal crests of nutlets very narrow and sharp, with medial keel enclosing polygonal granulate areas.

Corolla-tube shorter than calyx; plants erect to prostrate, comparatively coarse-stemmed; leaves 3–7 mm. broad; Californian.

Plant dye-stained throughout; nutlets 2..9. *P. catalinensis.*

Plant dye-stained if at all only at base; nutlets 4.....10. *P. canescens.*

Corolla-tube equalling or slightly exceeding the calyx; plants very slender, strict or ascending; leaves 1.5–2.5 mm. broad; Chilian. .....11. *P. tinctorius.*

Transverse dorsal crests of nutlets very low and broad, separated only by low lineate grooves.

Nutlets ovate, usually constricted only at apex, the base being rounded or rarely weakly constricted, dark-colored; plant dye-stained .....12. *P. Torreyi.*

Nutlets decidedly cruciform due to the abrupt equal constrictions at base and apex, glassy; plant only exceptionally dye-stained.

Calyx 5–7 mm. long and nearly as wide; nutlets 2–2.7 mm. long; inflorescence bracteate; plant coarse, few-stemmed.13. *P. shastensis.*

Calyx 3–5(–7) mm. long, and about half as broad; nutlets 1.5–2 mm. long; slender, many-stemmed plants.....14. *P. tenellus.*

Leaves opposite at least below.

Nutlets attached to gynobase by a more or less well developed stipe-like ventral projection. § *Echidiocarya.*

Stipe-like base about equaling body of nutlet, frequently united into pairs..... 15. *P. Pringlei.*

Stipe-like base less than half length of body of nutlet, never joined into pairs .....16. *P. californicus.*

Nutlets attached directly to gynobase, without a definite stipe-like ventral prolongation. § *Allocarya.*

Plant perennial.
Flowers solitary in the axils.
Leaves linear; style greatly surpassing the nutlets. 17. *P. Kunthii.*
Leaves oblance-linear; style shorter or about equaling nutlets.
Leaves obtusish usually strigose-hispidulous 10–15 mm. long; corolla small, 2–3 mm. broad; compact alpine plants. . . . . 18. *P. pygmaeus.*
Leaves acute, somewhat ciliate-strigose along margins and below on midrib; corolla 4–5 mm. broad; loosely branched submontane plants. 19. *P. linifolius.*
Flowers in axillary glomerules or racemes, frequently terminal; leaves linear.
Style greatly surpassing the nutlets. . . . . 20. *P. mollis.*
Style about equaling nutlets or evidently exceeded by them.
Pedicels becoming 2–5(–8) mm. long; mature herbage glabrate.
Leaves 2–2.5 mm. long; stems simple; calyx-lobes narrowly oblong, acutish, 3 mm. long. 21. *P. mexicanus.*
Leaves 4.4–5 mm. long; stems branched above; calyx-lobes narrowly linear, obtusish, 2 mm. long . . . . . 22. *P. pedicellaris.*
Pedicels evidently less than 2 mm. long; mature herbage somewhat strigose-hispid.
Leaves 25(20)–60 mm. long; fruiting calyx 3 mm. long, lobes very narrowly linear; inflorescence a rather loose elongated raceme 15–20 mm. long, sparsely bracteate or naked . . . . . 23. *P. humilis.*
Leaves 6–15(–25) mm. long; fruiting calyx 2 mm. long, lobes lance-linear; inflorescence a dense stout glomerule, 5–10 mm. long, leafy bracted throughout . . . . . 24. *P. congestus.*
Plant annual.
Spikes geminate. . . . . 25. *P. Scouleri.*
Spikes solitary.
Dorsal keel extending down length of nutlet, usually well developed.
Scar of nutlet solid, not below level of ventral keel; nutlets vitreous; Australian. . . . . 26. *P. australasicus.*
Scar of nutlet deeply excavated, below level of ventral keel; nutlets usually dull or glossy; Californian.
Nutlets 1–1.5 mm. long, weakly keeled dorsally; stems prostrate, much branched; fruiting calyces crowded . . . . . 27. *P. Piperi.*
Nutlets 1.5–2 mm. long, strongly keeled dorsally; stems erect or ascending, loosely branched; fruiting calyces remote. . . . . 28. *P. Greenei.*
Dorsal keel not extending down to the middle of the nutlet, usually weakly developed.
Scar of nutlet nearly medial; plant dye-stained. 29. *P. patagonicus.*
Scar of nutlet at or near the base; plant not dye-stained.

Ventral keel of nutlet sunken in a longitudinal groove; pedicels of lower fruiting calyces 5–20 mm. long, slender, spreading or recurved.
Nutlets smooth and shiny, ovoid.....30. *P. lithocaryus.*
Nutlets roughened, somewhat compressed.
31. *P. Chorisianus.*
Ventral keel of nutlet prominent, not in a groove; pedicels of lower fruiting calyces less than 5 mm. long, coarse, stiff, strict or ascending.
Midrib of calyx-lobes becoming indurated and enlarged in fruit; calyx sessile or subsessile by a narrowly conic base, usually asymetrical in fruit.
Plant very stout and fleshy.....32. *P. glaber.*
Plant not stout and fleshy.
Nutlets transversely rugose.....33. *P. humistratus.*
Nutlets reticulately rugose.
Branches strict or ascending.....34. *P. stipitatus.*
Branches prostrate or widely spreading.
Branches stiff; bracts few, mainly near base.....35. *P. divergens.*
Branches merely stiffish; bracts more or less throughout inflorescence. 36. *P. Nelsoni.*
Midrib of calyx-lobes scarcely indurate or thickened in fruit; calyx-lobes tending to differ sharply from the tube in structure; calyx usually pedicellate, symetrical, base broadly conic.
Plant sparsely hispid, lacking appressed hairs.
Calyx 2.5–4 mm. long, short pedicellate; calyx-lobes 1–2 mm. long, much surpassed by corolla; inflorescence naked or with 1 or 2 bracts.....39. *P. Parishii.*
Calyx 4–6 mm. long, subsessile; calyx-lobes 2–3 mm. long, about equaling corolla; inflorescence conspicuously leafy bracted.....40. *P. salsus.*
Plant with pubescence at least in part of appressed hairs.
Calyx-lobes spreading or reflexed in fruit, usually twice length of fruit.
Nutlets reticulately rugose; scar large. 37. *P. plebejus.*
Nutlets transversely rugose; scar medium size.....38. *P. trachycarpus.*
Calyx-lobes connivent to ascending, 1–2 times length of nutlets.
Calyx firm, strict; plant stiffly erect, glabrate.....41. *P. strictus.*
Calyx herbaceous, tending to spread; plant prostrate to erect but not stiff, usually densely pubescent.
Calyx-lobes 2–3 mm. long, 2 times length of nutlets.

Leaves extremely narrow, 1–1.5 mm. broad; inflorescence practically naked.....42. *P. tenuifolius.*
Leaves broadly linear, 2–5 mm. broad; inflorescence leafy-bracted.
Nutlets not at all rugose or granulate.....43. *P. nitens.*
Nutlets rugose or granulate or both.....44. *P. orthocarpus.*
Calyx-lobes 1–2 mm. long, 1–1.5 times length of nutlets.
Leaves fleshy, terete. 45. *P. mesembryanthemoides.*
Leaves herbaceous, flattened.
Nutlets muricate.....46. *P. muricatus.*
Nutlets rugose.
Nutlets transversely rugose, rugae usually low and broad; inflorescence usually naked above.....47. *P. scopulorum.*
Nutlets reticulately rugose, rugae usually narrow and high; inflorescence usually leafy-bracted.
Plant closely prostrate.....48. *P. Lechleri.*
Plant erect or ascending. 49. *P. procumbens.*

1. Plagiobothrys Kingii (Wats.) Gray, Proc. Am. Acad. xx. 281 (1885). *Eritrichium Kingii* Wats. Bot. King Exped. 243, t. 23 (1871). *Sonnea Kingii* Greene, Pittonia i. 23 (1887). *Krynitzkia Kingii* Wats. acc. to Hillman, Agric. Exper. Sta. Nev. Bull. xxiv. 71 (1894).—Western Nevada and adjacent California. Apparently a rare species and known only from the vicinity of southern Washoe County, Nevada. It is well marked by its coarse spreading pubescence, large flowers, and naked geminate or ternate racemes.

2. P. Harknessii (Greene) Nels. & Macbr. Bot. Gaz. lxii. 143 (1916). *Sonnea Harknessii* Greene, Pittonia i. 23 (1887).—Eastern Oregon to Inyo County, California, and eastward to northwestern Utah. Much more common than the last and perhaps only a form of it.

3. P. Jonesii Gray, Synop. Fl. ed. 2, ii. pt. 1, 430 (1886). *Sonnea Jonesii* Greene, Pittonia i. 23 (1887).—Eastern border of Southern California. Specimens from Inyo County, California, differ from the type in their prostrate habit and may represent an unnamed variety or species. The nutlets of this species remarkably simulate those of *Amsinckia tessellata*. Because of this Jones, Contr. W. Bot. xii. 57 (1908), wrote that "Plagiobothrys Jonesii Gray is an Amsinckia in every thing but the flowers, which are white. It has the tessellated pavement-like nutlets of A. tessellata and a little sharper

rugae, and illustrates again the very slim foundation on which some Borraginaceous genera rest." These ideas were accepted and repeated by Nelson and Macbride, Bot. Gaz. lxii. 143 (1916), in the following form,—"In this connection Jones has called attention to the fact that *P. Jonesii* . . . is an *Amsinckia* in everything but its white flowers. . . . The pubescence of *P. Jonesii* and the tessellated nutlets surely suggest a relationship to *A. tessellata*, but the white and short corollas that are so widely at variance with the long yellow ones of *Amsinckia* are perfectly congeneric with the SONNEA section of *Plagiobothrys*." The above quotations show a striking lack of acquaintance with the real characters of *Plagiobothrys* and *Amsinckia* and are examples of hasty generalizations based upon superficialities. *Plagiobothrys Jonesii* and immediate relatives simulate species of *Amsinckia* in the form of nutlets, but are clearly not directly related in that genus, for like other species of *Plagiobothrys* they have undivided cotyledons and short appendaged corollas.

4. P. HISPIDUS Gray, Proc. Am. Acad. xx. 286 (1885). *Sonnea hispida* Greene, Pittonia i. 22 (1887).—Eastern Oregon southward through northeastern California and extreme western Nevada to the region about Mono Lake.

4a. **P. hispidus**, var. **foliaceus** (Greene), comb. nov. *Sonnea foliacea* Greene, Pittonia i. 222 (1888). *P. foliaceus* Nels. & Macbr. Bot. Gaz. lxii. 143 (1916).—Known only from Washoe Mts., Nevada. Nelson and Macbride speak of the "dorsal depressions of the nutlets" as being "particularly unique" for this plant, but I find that exactly similar developments are frequent in **P. hispidus**, var. **genuinus** and in *P. glomeratus*. The nutlets of the var. *foliaceus* are 2–2.5 mm. long, instead of 1.5–2 mm. long as in the var. *genuinus*, and appear to be elongated so that the scar appears decidedly above the middle rather than near the middle of the nutlet. The dorsal surface of the nutlets in the var. *foliaceus* lack the coarse papillae or irregular short elongate roughenings characteristic of the var. *genuinus*, instead showing a maximum development of the granulations which in the case of the var. *genuinus* are crowded by the larger rugosities nearly to extinction. Greene's species is not given specific recognition because it is only known from the type collection. It is possible that the plant is a hybrid between *P. hispidus* and *P. glomeratus*.

5. P. GLOMERATUS Gray, Proc. Am. Acad. xx. 286 (1885). *Sonnea glomerata* Greene, Pittonia i. 22 (1887).—Western Nevada, rare. Characterized by its large rather smooth nutlets.

6. P. NOTHOFULVUS Gray, Proc. Am. Acad. xx. 285 (1885). *Eritrichium nothofulvum* Gray, l. c. xvii. 227 (1882).—Frequent over the length of California and locally reaching to the Columbia River Valley.

7. P. ARIZONICUS (Gray) Greene in Gray, Proc. Am. Acad. xx. 284 (1885). *Eritrichium canescens*, var. *arizonicus* Gray, l. c. xvii. 227 (1882).—Western New Mexico to Southern California. The species grows in arid situations, and in California is primarily a plant of the desert from which it occasionally extends through the low passes to the dryest of the transmontane valleys. The species is quite variable as to nutlets, and in calyx and habit makes a close approach to, if it does not actually intergrade with *P. canescens*.

8. **P. fulvus** (H. & A.), comb. nov. *Myosotis fulva* H. & A. Bot. Beech. 38 (1830). *Eritrichium fulvum* A.DC. Prodr. x. 132 (1846). *M. alba* Colla, Mem. Acad. Torino xxxviii. 128, t. 42 (1835). *P. rufescens* F. & M. Ind. Sem. Hort. Petrop. ii. 46 (1835 or early 1836). *E. asperum* Phil. Anal. Univ. Chile xliii. 516 (1873). *E. laxiflorum* Phil. l. c. xc. 527 (1895). *P. rufescens*, var. *laxiflorus* Reiche, Anal. Univ. Chile cxxi. 812 (1908). *E. Rengifoanum* Phil. l. c. xc. 529 (1895). *P. rufescens*, var. *Renjifoanus* Reiche, l. c.—Central Chile.

8a. **P. fulvus**, var. **campestris** (Greene), comb. nov. *P. campestris* Greene, Pittonia ii. 282 (1892). *P. rufescens*, var. *campestris* Jeps. Fl. W. Midd. Calif. 446 (1901). *P. californicus* Greene, Pittonia ii. 231 (1892); not Greene (1887).—California from San Luis Obispo County and the upper San Joaquin Valley northward through the Sacramento Valley to southern Oregon. Through a misunderstanding Gray, Proc. Am. Acad. xx. 282 (1885), cited a specimen of *P. rufescens* as from "near Los Angeles." The Nevin collection upon which this record was based actually came from "n. Sacramento Co." The Oregon collections may represent a distinct variety, their nutlets being dark in color and nearly lacking the transverse dorsal rugae. The Californian plants do not differ in fruit from the Chilian ones, and it is only because the southern plants seem more slender than the northern material that the latter is put into a distinct variety.

9. P. CATALINENSIS (Gray) Macbr. Proc. Am. Acad. li. 546 (1916). *P. arizonicus*, var. *catalinensis* Gray, Synop. Fl. ed. 2, ii. pt. 1, 431 (1886).—Endemic on Santa Catalina Island, California. This species is intermediate in its characters between *P. canescens* and *P. arizonicus*, having the few nutlets and dye-stained herbage of the latter, and the spreading non-circumscissile calyx of the former. As dye is frequently developed in indubitable *P. canescens* (cf. *Heller*

7758 from Mohave, Calif.), and specimens of the var. *apertus* frequently have imperfectly circumscissile calyces, the claims of *P. arizonicus* and *P. catalinensis* to specific rank are clouded ones, the two species being maintained only for convenience pending further study.

10. P. CANESCENS Benth. Pl. Hartw. 326 (1849). *Eritrichium canescens* Gray, Proc. Am. Acad. x. 57 (1874). *P. microcarpa* Greene, Pittonia i. 21 (1887). *P. canescens*, var. *apertus* Greene, l. c.—Ranging the length of California. The typical phase of this species is the small, 1.5–2 dm. high, erect-growing plant which is most common in the Sacramento Valley. The var. *apertus* is best restricted to the large prostrate or subprostrate plant, usually with stellately spreading calyx-lobes, which is most common in the upper San Joaquin Valley. There are numerous other unnamed variations.

11. P. TINCTORIUS (R. & P.) Gray, Proc. Am. Acad. xx. 283 (1885). *Lithospermum tinctorium* R. & P. Fl. Peruv. ii. 4, t. 114 (1799). *Eritrichium tinctorium* A.DC. Prodr. x. 132 (1846). *L. myosotoides* Lehm. Asperif. ii. 319 (1818). *L. tingens* R. & S. Syst. iv. 44 (1819). *E. verrucosum* Phil. Linnaea xxix. 17 (1857).—Central Chile.

12. P. TORREYI Gray, Proc. Am. Acad. xx. 284 (1885). *Eritrichium Torreyi* Gray, l. c. x. 58 (1875). *Cryptanthe Torreyi* Rydb. Mem. N. Y. Bot. Gard. i. 331 (1900).—California; apparently confined to vicinity of Yosemite Valley.

12a. **P. Torreyi,** var. **diffusus**, var. nov., laxus prostratus; caulibus ad basin florigeris; floribus numerosis; calyce fructifero 3–4 mm. longo 3–4.5 mm. lato; bracteis grandis conspicuissimis.—CALIFORNIA: Sierra Valley, *Lemmon.* Donner Lake, *Heller 6986* (TYPE, Gray Herb.). Sunnyside, Lake Tahoe Region, *Eastwood 1067.* About Tallac, July 1904, *M. S. Baker.* Echo Camp on Lincoln Highway, *Heller 12,158.* Yosemite, 1878, *Lemmon.* Upper San Joaquin, Madera Co., 1895, *Congdon.* Okenden, Pine Ridge, Fresno Co., *Hall & Chandler 273.* Volcano Cr., Tulare Co., *Hall & Babcock 5317.* This is the most common and widely distributed phase of *P. Torreyi.* It was mentioned by Gray when he described the species, but was not named by him. The type of *P. Torreyi* is evidently *Torrey 338* and that is the slender erect-growing plant with few leaves and bracts which is frequently collected in the region about Yosemite Valley. The typical phase of *P. Torreyi* and the var. *diffusus* are quite dissimilar in aspect, differing as they do in direction of growth, leafiness, amount of branching, and size of bracts. Young forms of var. *diffusus* might be confused with typical *Torreyi*, but may be usually distinguished by having the lower floral bracts three or more times as long as the calyx.

12b. **P. Torreyi**, var. **perplexans**, var. nov., erectus gracilior altior apicem versus laxe ramosus; bracteis inconspicuis paucis; nuculis ovatis basin versus paulo constrictis; habitu *P. tenelli* sed caulibus colorantibus.—CALIFORNIA: Greenhorn Pass, alt. 4–5000 ft., *Purpus 5542* (TYPE, Univ. Calif.). Greenhorn Range, Kern Co., alt. 5000 ft., *Hall & Babcock 5041*. This variety has a characteristic habit, but it is primarily distinguished by its nutlets which, while most like those of *P. Torreyi*, have weakly constricted bases and so suggest the nutlets of *P. tenellus*. The new variety can be looked upon as a connecting link between *P. tenellus* and *P. Torreyi*, but due to its combining of characters it suggests a hybrid and so, pending further information, I am leaving the status of its possible parents unchanged.

13. P. SHASTENSIS Greene in Gray, Proc. Am. Acad. xx. 284 (1885). —California from the lower San Joaquin Valley northward to southern Oregon; not common. A very near relative of *P. tenellus* and perhaps only a rankly growing strain of it, but usually to be recognized by its large fruiting calyces and nutlets, erect simple few-flowered stems, and soft pubescence. It superficially suggests *P. canescens* but may be readily told by its very different nutlets.

14. P. TENELLUS (Nutt.) Gray, Proc. Am. Acad. xx. 283 (1885). *Myosotis tenella* Nutt. in Hook. Kew Jour. Bot. iii. 295 (1851), nom. subnudum. *Eritrichium tenellum* Gray, l. c. x. 57 (1875). *P. echinatus* Greene, Pittonia iii. 262 (1898). *P. asper* Greene, l. c. *P. humifusa* Jones, Contr. W. Bot. xiii. 7 (1910).—British Columbia to northern Utah and Nevada, and southward through the coastal drainage of California to northern Lower California. This is the most widely ranging and most variable of the species of true *Plagiobothrys*. Greene has named a number of forms, but these do not seem striking or constant enough to warrant their recognition. *Plagiobothrys asper* is a conspicuously hispid phase, which is not geographically correlated and intergrades so gradually and completely with the normal villous forms that its recognition even as a *forma* seems unpractical. *Plagiobothrys humifusus* is a compact form of *P. asper*.

14a. **P. tenellus**, var. **parvulus** (Greene), comb. nov. *P. parvulus* Greene, Pittonia iii. 261 (1898).—California; along the South Coast Ranges from San Francisco Bay Region to San Luis Obispo County. This is the prevailing form of the species in the area of its occurrence, and from its geographic correlation perhaps deserves minor recognition. It differs from other forms of the species by having its nutlets 1–1.5 mm. long and its fruiting calyces 2 mm. long or less.

In the typical form of the species the nutlets are 1.5–2 mm. long and the calyces measure 2–3 mm. in length.

14b. **P. tenellus**, var. **colorans**, comb. nov. *P. colorans* Greene Pittonia iii. 262 (1898).—Known only from extreme northern California. A poorly understood plant which appears to be only a dye-stained form of *P. tenellus*.

15. P. PRINGLEI Greene, Pittonia i. 21 (1887). *Echidiocarya arizonica* Gray, Proc. Am. Acad. xi. 89 (1875).—Southern Arizona and adjacent Sonora.

16. P. CALIFORNICUS (Gray) Greene, Bull. Calif. Acad. ii. 407 (1887). *Echidiocarya californica* Gray, Proc. Am. Acad. xii. 164 (1877). *P. Cooperi* Gray, l. c. xx. 285 (1885).—Southern California and northern Lower California. Differing from the last only in the length of the stipe-like base of the nutlet. There are the following well marked varieties.

Corolla 4–7 mm. broad; pubescence fine, appressed, usually somewhat silky.....**var.** ***genuinus***.
Corolla 1–3 mm. broad; pubescence usually spreading.
  Leaves narrowly linear, 2–2.5 mm. broad; pubescence fine, canescent.....**var.** ***gracilis***.
  Leaves oblanceolate, 3–5 mm. broad; pubescence coarse, fulvescent.
  Racemes dense, hidden among the leaves..... var. *ursinus*.
  Racemes elongated, projected from among the leaves and evident.....**var.** ***fulvescens***.

16a. **P. californicus**, var. **genuinus**, var. nov.—CALIFORNIA: Near San Gabriel, *Brewer 147*. Near Upland, *Johnston 1839*. San Bernardino, *Parry 213*. Corona, *Johnston 1876*. Las Flores, *Abrams 3276*. La Jolla, *Clements 110*. San Diego, *Spencer 126; Brandegee 1637*. LOWER CALIFORNIA: Tia Juana Valley, April 1882, *Pringle*. San Rafael Valley, April 1885, *Orcutt*. The above cited suite of selected specimens covers the range of *genuinus*. It is the common form on the grassy hillsides on the coastal drainage of Southern California. The stems are long, lax, and strigose-canescent. It has conspicuous corollas, large fruiting calyces, and broad oblanceolate leaves.

16b. **P. californicus**, var. **gracilis**, var. nov., hispidulosus minutiflorus; caulibus pergracilibus; foliis lanceolato-linearibus acutis sparsis; sepalis angustis.—CALIFORNIA: La Jolla, *Clements 111*. San Diego, *Brandegee 1658* (TYPE, Gray Herb.); *Orcutt 1014*, in part. LOWER CALIFORNIA: Cedros Island, *Palmer 711*. Without locality *Parry*. A very well marked variety which apparently grows with var. *genuinus* and seems much less common. It is perhaps specifically distinct.

16c. **P. californicus**, var. **ursinus** (Gray), comb. nov. *Echidiocarya ursina* Gray, Proc. Am. Acad. xix. 90. (1883). *P. ursinus* Gray, l. c. xx. 285 (1885).—CALIFORNIA: San Bernardino Mts., *Parish 927* (TYPE); *Munz 5725*. San Jacinto Mts., *Spencer 1656; Munz & Johnston 5416*. LOWER CALIFORNIA: Without locality. *Orcutt 908*. A variety inhabiting warm montane valleys and differing from the following only in its congested inflorescence.

16d. **P. californicus**, var. **fulvescens**, var. nov., hispidus minutiflorus; caulibus elongatis prostratis; foliis oblanceolatis; inflorescentia elongata remotiflora a foliis non obscurata.—CALIFORNIA: Santa Barbara, 1888, *T. S. Brandegee* (TYPE, Gray Herb.). Witch Creek, *Alderson 7625*. LOWER CALIFORNIA: Hansen's Ranch, April 1885, *Orcutt*.

17. **P. Kunthii** (Walp.), comb. nov. *Anchusa Kunthii* Walp. Nov. Act. Nat. Cur. xix. suppl. 1, 372 (1843). *Allocarya linifolia*, var. *Kunthii* Macbr. Proc. Am. Acad. li. 545 (1916). *Antiphytum Walpersii* A.DC. Prodr. x. 122 (1846). *Eritrichium Walpersii* Wedd. Chlor. And. ii. 90 (1859).—I associate with this name two Bolivian collections (*Mandon 382, 383*) in the herbarium of the New York Botanical Garden. The flowers are solitary in the axils and the corollas have very elongate tubes and conspicuous (ca. 4 mm. broad) limbs. The style surpasses the mature nutlets by nearly 2 mm. The pedicels are very slender becoming nearly 5 mm. long. Walpers's description is extremely short and vague, the Mandon collections being associated with it only because they come from Lake Titicaca, the type region of *Anchusa Kunthii*, and because they alone among the available Peruvian and Bolivian material agree with the "floribus solitariis, axillaribus" of the original diagnosis.

18. **P. pygmaeus** (HBK.), comb. nov. *Anchusa pygmaea* HBK. Nov. Gen. et Sp. iii. 92 (1818). *Eritrichium pygmaeum* Wedd. Chlor. And. ii. 89 (1859). *Lithospermum alpinum* R. & S. Syst. iv. 742 (1819).—Ecuador.

19. **P. linifolius** (Lehm.), comb. nov. *Anchusa linifolia* Lehm. Asperif. i. 215 (1818). *Antiphytum linifolium* A.DC. Prodr. x. 121 (1846). *Eritrichium linifolium* Wedd. Chlor. And. ii. 89 (1859). *Krynitzkia linifolia* Gray, Proc. Am. Acad. xx. 266 (1885). *Allocarya linifolia* Macbr. Proc. Am. Acad. li. 545 (1916). *Anchusa oppositifolia* HBK. Nov. Gen et Sp. iii. 91, t. 200 (1818).—Ecuador.

20. **P. mollis** (Gray), comb. nov. *Eritrichium molle* Gray, Proc. Am. Acad. xix. 89 (1883). *Allocarya mollis* Greene, Pittonia i. 20 (1887).—California, along the northern Sierras, and in adjacent Nevada and Oregon.

20a. **P. mollis** var. **vestita** (Greene), comb. nov. *Allocarya vestita* Greene, Erythea iii. 125 (1895). *A. mollis*, var. *vestita* Jepson, Fl. Midd. W. Calif. 442 (1901).—Middle California; rare. Known only from Marin and Tulare counties. It is apparently a geographical variety differing from the typical form of the species in its darker and more loosely reticulate-rugose nutlets.

21. **P. mexicanus** (Macbr.), comb. nov. *Allocarya mexicana* Macbr. Contr. Gray Herb. lix. 34 (1919).—Mexico. Known only from the type collection made in the state of Mexico.

22. **P. pedicellaris** (Phil.), comb. nov. *Eritrichium pedicellare* Phil. Anal. Univ. Chile xc. 549 (1895). *Allocarya pedicellaris* Reiche, Anal. Univ. Chile cxxi. 809 (1907).—Chile. Known to me only by descriptions.

23. **P. humilis** (R. & P.), comb. nov. *Myosotis humilis* R. & P. Fl. Peruv. ii. 5 (1799). *Eritrichium humile* A.DC. Prodr. x. 133 (1846). *Allocarya humilis* Greene, Pittonia i. 17 (1887). *Amsinckia humifusa* Walp. Nov. Act. Nat. Cur. xix. suppl. 1, 371 (1843). *Benthamia humifusa* Druce, Rep. Bot. Exch. Cl. Brit. Isl. iv. 298 (1916). *E. Germaini* Phil. Anal. Univ. Chile xc. 550 (1895). *Allocarya Germaini* Reiche, Anal. Univ. Chile cxxi. 809 (1907).—Peru and Bolivia. Apparently also in Chile, Philippi's species being doubtfully associated with the Peruvian one.

24. **P. congestus** (Wedd.), comb. nov. *Eritrichium humile*, var. *congestum* Wedd. Chlor. And. ii. 88 (1859).—Peru and Bolivia, apparently at high altitudes.

25. **P. Scouleri** (H. & A.), comb. nov. *Myosotis Scouleri* H. & A. Bot. Beech. 370 (1840), nom. subnudum. *Eritrichium Scouleri* A.DC. Prodr. x. 130 (1846). *Krynitzkia Scouleri* Gray, Proc. Am. Acad. xx. 267 (1885). *Allocarya Scouleri* Greene, Pittonia i. 18 (1887). *E. sessiliflorum* A.DC. l. c. 133. *A. sessilifolia* Greene, l. c. 17. *A. hirta* Greene, l. c. 161 (1888). *A. Scouleri*, var. *hirta* Nels & Macbr. Bot. Gaz. lxi. 36 (1916). *A. calycosa* Piper, Contr. U. S. Nat. Herb. xxii. 101 (1920). *A. figurata* Piper, l. c. 101. *A. dichotoma* Brand in Fedde, Repert. xviii. 313 (1922).—Oregon to southern British Columbia, and apparently also in central Chile.

26. **P. australasicus** (A.DC.), comb. nov. *Eritrichium australasicum* A.DC. Prodr. x. 134 (1846). *Allocarya australasica* Greene, Erythea iii. 57 (1895).—Australia. This is the only extra-American species of the genus.

27. **P. Piperi**, nom. nov. *Allocarya microcarpa* Piper, Contr. U. S. Nat. Herb. xxii. 91 (1920); not *P. microcarpus* Greene (1887).—

Known only from Mariposa County, California. Superficially nearly indistinguishable from *P. scopulorum*, but in fruit-characters clearly allied with *P. Greenei*.

28. **P. Greenei** (Gray), comb. nov. *Echinospermum Greenei* Gray, Proc. Am. Acad. xii. 163 (1877). *Allocarya Greenei* Greene, Bot. San Francisco 259 (1894). *A. Echinoglochin* Greene, Pittonia i. 15 (1887). *A. Austinae* Greene, Pittonia i. 18 (1887). *A. hystricula* Piper, Contr. U. S. Nat. Herb. xxii. 87 (1920). *A. acanthocarpa* Piper, l. c. 87. *A. oligochaeta* Piper, l. c. 88. *A. echinacea* Piper, l. c. 88. *A. cristata* Piper, l. c. 89. *A. Eastwoodae* Piper, l. c. 89. *A. glyptocarpa* Piper, l. c. 90. *A. spiculifera* Piper, l. c. 90. *A. anaglyptica* Piper, l. c. 90. *A. papillata* Piper, l. c. 91. *A. distantiflora* Piper, l. c. 91.—Occuring over the length of California. Very conspicuously variable in the sculpturing and arming of the nutlets, even in a single locality, and apparently showing no tendency to break up into definite geographic variants. Some of the conspicuous extremes might well be treated as *formae*. *Allocarya glyptocarpa* probably is specifically distinct differing from the great mass of *P. Greenei* in its large corollas and elongate nutlets.

29. **P. patagonicus**, sp. nov., annuus tinctus; caulibus prostratis diffuse ramosis ca. 1 dm. longis sparse breveque villosis; foliis ovato-oblongis vel oblongis 13–15 mm. longis 3–5 mm. latis, infimis oppositis; racemis elongatis maturitate remote florentibus cum bracteis foliaceis; floribus albis ca. 2.5 mm. longis; corollae tubo calyce longiori cylindrato, lobis ascendentibus; calyce strigoso-hispido ad basin partito ad anthesin ca. 2 mm. longo fructifero aperto 3–4 mm. longo; nuculis 4 late ovatis ca. 1.5 mm. longis dorso congeste humileque rugosis ventrale carinatis in media parte ad gynobasin humilem adfixis.—ARGENTINA: Patagonia, 50° 3′ Lat., 1882, *Moreno & Tonini 530* (TYPE, N. Y. Bot. Gard.). San Carlos de Bariloche, 800 m. alt., *Buchtien 118* (U. S.). In gross aspect much resembling *P. Torreyi*, var. *diffusus*, and in most parts suggesting a true *Plagiobothrys* rather than a species of *Allocarya* which it must be because of its opposite lower leaves. It is probably the "*Plagiobothrys decumbens*" of Macloskie, Fl. Patag. 679 (1905), and perhaps also the "*Cryptanthe globulifera*" of Skottsberg, Svenska Vet. Akad. Handl. lvi. no. 5, 290 (1916).

30. **P. lithocaryus** (Greene), comb. nov. *Krynitzkia lithocarya* Greene in Gray, Proc. Am. Acad. xx. 265 (1885). *Allocarya lithocarya* Greene, Pittonia i. 12 (1887).—California, along the North Coast Ranges. Rare.

31. **P. Chorisianus** (Cham.), comb. nov. *Myosotis Chorisiana* Cham. Linnaea iv. 444 (1829). *Eritrichium Chorisianum* A.DC. Prodr. x. 130 (1846). *Krynitzkia Chorisiana* Gray, Proc. Am. Acad. xx. 267 (1885). *Allocarya Chorisiana* Greene, Pittonia, i. 13 (1887). *E. connatifolium* Kell. Proc. Calif. Acad. ii. 163, f. 51 (1862). *A. Hickmanii* Greene, Pittonia i. 13 (1887). *A. myriantha* Greene, Erythea iii. 125 (1895). *A. Jonesii* Brand in Fedde, Repert. xviii. 313 (1922).—California, from San Francisco to Santa Barbara counties.

32. **P. glaber** (Gray), comb. nov. *Lithospermum glabrum* Gray, Proc. Am. Acad. xvii. 227 (1882). *Allocarya glabra* Macbr. Proc. Am. Acad. li. 543 (1916). *A. salina* Jepson, Fl. W. Midd. Calif. 442 (1901).—Middle California, and doubtfully also Arizona. Mrs. Brandegee, Zoe v. 94 (1901), doubts the Arizonian origin of the type of *L. glabrum*. No undoubted material is at hand from Arizona, and Professor J. J. Thornber of the University of Arizona writes me that he has neither collected such a plant in Arizona nor knows of anyone else having done so. It is possible that the following four species had best be treated as varieties of the present one.

33. **P. humistratus** (Greene), comb. nov. *Allocarya humistrata* Greene, Pittonia i. 16 (1887). *A. scripta* Greene, l. c. 142. *A. limicola* Piper, Contr. U. S. Nat. Herb. xxii. 97 (1920). *A. sigillata* Piper, l. c.—Middle California.

34. **P. stipitatus** (Greene), comb. nov. *Allocarya stipitata* Greene, Pittonia i. 19 (1887).—*Lappula stipitata* Druce, Rep. Bot. Exch. Cl. Brit. Isl. v. 38 (1918). *A. stipitata*, subsp. *micrantha* Piper, Contr. U. S. Nat. Herb. xxii. 94 (1920). *A. ambigens* Piper, l. c. 96. —Middle California. There are two conspicuous extremes in flower-size.

35. **P. divergens** (Piper), comb. nov. *Allocarya divergens* Piper, Contr. U. S. Nat. Herb. xxii. 92 (1920). *A. charaxata* Piper, l. c. 96.—California, from Tulare County to San Diego County.

36. **P. Nelsonii** (Greene), comb. nov. *Allocarya Nelsonii* Greene, Erythea iii. 48 (1895). *A. leptoclada* Greene, Pittonia iii. 109 (1896). *A. oricola* Piper, Contr. U. S. Nat. Herb. xxii. 92 (1920). *A. asperula* Piper, l. c. 93. *A. Wilcoxii* Piper, l. c. 93. *A. setulosa* Piper, l. c. 93. *A. Leibergii* Piper, l. c. 95. *A. tuberculata* Piper, l. c. 95. *A. fragilis* Brand in Fedde, Repert. xviii. 312 (1922).—Eastern Oregon and northern Nevada and northwestward to Montana and adjacent Saskatchewan.

37. **P. plebejus** (Cham.), comb. nov. *Lithospermum plebejum* Cham. Linnaea iv. 446 (1829). *Eritrichium plebeium* A. DC. Prodr.

x. 133 (1846). *Krynitzkia plebeia* Gray, Proc. Am. Acad. xx. 266 (1885). *Allocarya plebeia* Greene, Pittonia i. 16 (1887).—Alaska.

38. **P. trachycarpus** (Gray), comb. nov. *Krynitzkia trachycarpa* Gray, Proc. Am. Acad. xx. 266 (1885). *Allocarya trachycarpa* Greene, Pittonia i. 14 (1887). *Myosotis californica* F. & M. Ind. Sem. Hort. Petrop. ii. 42 (1835). *Eritrichium californicum* A.DC Prodr. x. 130 (1846). *K. californica* Gray, l. c. *A. californica* Greene, l. c. 20; not *P. californicus* Greene (1887). *A. diffusa* Greene, l. c. 14. *A. interrasilis* Piper, Contr. U. S. Nat. Herb. xxii. 108 (1920). *A. commixta* Brand in Fedde, Repert. xviii. 312 (1922).—Coast Ranges of middle California. The type of *K. trachycarpa*, *Brewer 1007* from Sonoma County, is a good match for authentic specimens of *M. californica*, and appears to represent the very slender plant with long lax leafy stems and linear spreading calyx-lobes which seems to replace *P. scopulorum* in the region along the middle Coast Ranges of California. As I have taken it *P. trachycarpus* may consist of two things, the southern plants seeming to be less diffuse and to have shorter calyx-lobes.

39. **P. Parishii**, nom. nov. *Eritrichium Cooperi* Gray, Proc. Am. Acad. xix. 89 (1883). *Krynitzkia Cooperi* Gray, l. c. xx. 267 (1885). *Allocarya Cooperi* Greene, Pittonia i. 19 (1887); not *P. Cooperi* Gray (1885).—Mohave Desert of California.

40. **P. salsus** (Brandg.), comb. nov. *Allocarya salsa* Brandg. Bot. Gaz. xxvii. 452 (1899). *A. jacunda* Piper, Bull. Torr. Cl. xxix. 643 (1902). *A. Cusickii*, var. *jacunda* Nels. & Macbr. Bot. Gaz. lxi. 36 (1916).—Nevada and eastern Oregon.

41. **P. strictus** (Greene), comb. nov. *Allocarya stricta* Greene, Pittonia ii. 231 (1892).—Northern California, perhaps best restricted to the Calistoga plant.

42. **P. tenuifolius** (Gray), comb. nov. *Krynitzkia tenuifolia* Gray, Proc. Am. Acad. xx. 267 (1885). *Eritrichium tenuifolium* Phil. Anal. Univ. Chile xlii. 518 (1873), nom. nudum, & xc. 546 (1895). *Allocarya tenuifolia* Greene, Erythea iii. 57 (1895). *E. humile*, var. *capitatum* Clos in Gay, Fl. Chile iv. 471 (1849). *E. tenuifolium*, var. *longipes* Phil. l. c. xlii. 518 (1873). *A. tenuifolia*, var. *longipes* Reiche, Anal. Univ. Chile cxxi. 806 (1907).—Chile.

43. **P. nitens** (Greene), comb. nov. *Allocarya nitens* Greene, Pittonia iii. 108 (1896).—Nevada and Utah, apparently rare. Perhaps only a phase of the next.

44. **P. orthocarpus** (Greene), comb. nov. *Allocarya orthocarpa* Greene, Pittonia iv. 235 (1901).—Washington and Nevada, eastward to Utah and Colorado. A rare and poorly understood species.

45. **P. mesembryanthemoides** (Speg.), comb. nov. *Eritrichium mesembryanthemoides* Speg. Anal. Soc. Cientf. Argent. liii. 136 (1902).—Patagonia.

46. **P. muricatus** (R. & P.), comb. nov. *Lithospermum muricatum* R. & P. Fl. Peruv. ii. 4 (1799). *Eritrichium muricatum* A.DC. Prodr. x. 132 (1846). *Allocarya muricata* Reiche, Anal. Univ. Chile cxxi. 810 (1907).—Chile. This plant may be a *Cryptantha*, although Philippi's note, Anal. Univ. Chile xc. 540 (1895), makes it seem improbable. It is possible that the species should be amplified to include the concepts here called *P. procumbens* and *P. scopulorum*.

47. **P. scopulorum** (Greene), comb. nov. *Allocarya scopulorum* Greene, Pittonia i. 16 (1887). *Eritrichium californicum*, var. *subglochidiatum* Gray in Wats. Bot. Calif. i. 526 (1876). *Krynitzkia californica*, var. *subglochidiata* Gray, Proc. Am. Acad. xx. 266 (1885). *A. subglochidiata* Piper, Contr. U. S. Nat. Herb. xi. 485 (1906). *A. hispidula* Greene, l. c. 17. *A. Cusickii* Greene, l. c. 17. *A. penicillata* Greene, l. c. 18. *A. tenera* Greene, l. c. iii. 109 (1896). *A. cognata* Greene, l. c. iv. 235 (1901). *A. bracteata* Howell, Fl. N. W. Amer. 481 (1901). *A. cryocarpa* Piper, Contr. U. S. Nat. Herb. xxii. 98 (1920). *A. gracilis* Piper, l. c. 98. *A. laxa* Piper, l. c. 98. *A. pratensis* Piper, l. c. 99. *A. cernua* Piper, l. c. 100. *A. ramosa* Piper, l. c. 100. *A. vallata* Piper, l. c. 101. *A. undulata* Piper, l. c. 104. *A. minuta* Piper, l. c. 104. *A. scalpta* Piper, l. c. 104. *A. reticulata* Piper, l. c. 105. *A. areolata* Piper, l. c. 105. *A. inornata* Piper, l. c. 106. *A. media* Piper, l. c. 107. *A. divaricata* Piper, l. c. 107. *A. insculpta* Piper, l. c. 109. *A. dispar* Piper, l. c. 109. *A. granulata* Piper, l. c. 109. *A. conjuncta* Piper, l. c. 109. *A. corrugata* Piper, l. c. 110. *A. scalpocarpa* Piper, l. c. 111.—Western United States and adjacent Canada. This is the most common and widely distributed *Allocarya*, and that which has mostly borne the name *A. californica*. It varies considerably in the marking and sculpturing of the nutlets, and to a less extent in habit as well. A careful study will probably cause the recognition of a number of forms here submerged. There is a large-flowered plant on Vancouver Island (e.g. *Macoun 56, 680*), and a stiffish strict one of western Oregon (e.g. *Sheldon 10,577*) which may be distinct. Some plants from the Argentine, for the present referred to *P. procumbens*, seem indistinguishable from certain of the North American specimens.

48. **P. Lechleri**, nom. nov. *Eritrichium albiflorum* Griseb. Abhandl. Ges. Wiss. Gött. vi. 131 (1854); not *Myosotis albiflora* B. & S. in Hook. f. Fl. Antarct. ii. 329 (1847).—Patagonia and Fuego. This

is the plant which has been variously identified as *Eritrichium albiflorum* (Grisebach, l. c.), *E. diffusum* (Dusén, Svenska Exped. Magell. iii. 132 (1900)), and *Allocarya procumbens* (Skottsberg, Svenska Vet. Akad. Handl. lvi. 289 (1916)). It was a specimen of this species, incorrectly identified as *Myosotis albiflora*, that gave Greene, Erythea iii. 57 (1895), his reasons for proposing the combination, *Allocarya albiflora*. Regarding the identity of *Myosotis albiflora* B. & S. see the lengthy note by Skottsberg, l. c. 290–291, t. 23, f. 8a–d.

49. P. PROCUMBENS (Colla) Gray, Proc. Am. Acad. xx. 283 (1885). *Myosotis procumbens* Colla, Mem. Acad. Torino xxxviii. 130 (1834). *Eritrichium procumbens* A.DC. Prodr. x. 133 (1846). *Allocarya procumbens* Greene, Pittonia i. 17 (1887). *E. tenuicaule* Phil. Linnaea xxix. 18 (1857). *A. tenuicaulis* Macbr. Proc. Am. Acad. li. 544 (1916). *E. uliginosum* Phil. Anal. Univ. Chile xliii. 519 (1873). *A. uliginosa* Greene, l. c. 14. *E. calandrinioides* Phil. Anal. Univ. Chile xc. 541. (1895). *E. oppositifolium* Phil. l. c. 542. *A. oppositifolia* Reiche, Anal. Univ. Chile cxxi. 807 (1907). *E. polycaule* Phil. l. c. 542. *E. delicatulum* Phil. l. c. 544. *E. flavicans* Phil. l. c. 544. *E. pulchellum* Phil. l. c. 545. *E. cinereum* Phil. l. c. 545. *A. cinerea* Reiche, l. c. 808. *E. limonium* Phil. l. c. 546. *E. graminifolium* Phil. l. c. 547. *E. illapelinum* Phil. l. c. 548. *E. bracteatum* Phil. l. c. 548. *E. vernum* Phil. l. c. 550.—Chile and Argentine. This appears to be the South American homologue of *P. scopulorum*, and like it is very variable in its structures.

III. DIAGNOSES AND NOTES RELATING TO THE SPERMATOPHYTES CHIEFLY OF NORTH AMERICA.

By I. M. Johnston.

The subjoined paragraphs bring together miscellaneous data which have accumulated during the past few months as a by-product of general herbarium work. Considerable time has been spent by the author in ordering up the *Euphorbiaceae* of the Gray Herbarium. As a result of this work it has been found desirable to place on record certain undescribed species which have been detected and to make some new combinations which were needed in order that the naming of the collection could be strictly in accord with the International Rules of Nomenclature. Some time has also been spent in an

attempt to bring order into the covers of the Mexican Gnaphaliums. During the course of this work a few more undescribed species were found which seem worthy of record. Of particular interest in the present paper is the description of a new monotypic composite genus recently collected on the deserts of California.

Lilium Howellii, sp. nov., glabrum; cauli 3–7 dm. alto; bulbis ovoideis, squamis 2–3 cm. longis oblongo-lanceolatis; foliis obovatis vel oblanceolatis 2.5–4 cm. longis 10–17 mm. latis acutiusculis firmis saepe glaucis, superioribus in 3–6 verticillos dispositis, inferioribus alternis minoribus; floribus 1–3(–7) horizontalibus rubiginosis vel luride purpureis; segmentis paullo recurvatis 28–40 mm. longis 8 mm. latis.—OREGON: Coast Mt. of Curry County, June 13, 1884, *Thos. Howell* (TYPE, Gray Herb.). The species briefly described above is that called *L. Bolanderi* by Purdy, Garden lix. 331 (1901), and by Jepson, Fl. Calif. i. 311 (1921). The original description of *Lilium Bolanderi* Wats., Proc. Am. Acad. xx. 377 (1885), was based upon four collections which represent three distinct species. The Bolander plant from the Red Hills is that species which Purdy, l. c., described and figured as *L. Kelloggii;* the Rattan collection from near Arcata is *L. occidentalis* Purdy, Erythea v. 103 (1897); whereas the Rattan and the Howell collections from "near the State boundary" are both the plant current under the name *L. Bolanderi.* Purdy restricted the name *L. Bolanderi* to the last two elements of the Watsonian aggregate, arguing that Watson based his description primarily upon them. He disregarded, however, the fact that Watson, by citing the Bolander collection first and by coupling Bolander's name with the species, clearly showed his intentions of naming the Bolander plant. The Bolander specimen is not excluded from the original description of *L. Bolanderi*, but agrees with it as well as do any of the other collections cited. It seems best, therefore, to restrict the name *L. Bolanderi* to the Bolander collection, or in other words to take it as synonymous with the much later *L. Kelloggii* Purdy. The Oregon plant heretofore called *L. Bolanderi* is accordingly named, *L. Howellii.*

LILIUM PARDALINUM Kell. Hesperian (Sept. 1859). *L. pardalinum*, var. *angustifolium* Kell., l. c. *L. Roezli* Regel, Gartenfl. xix. 321, t. 667 (1870). *L. canadense*, var. *Hartwegii* Baker, Gard. Chron. 1165 (1871). *L. californicum* Domb. Fl. Mag. under plate 33 (1872). *L. pardalinum*, var. *californicum* Lindley in Baker, Jour. Linn. Soc. xiv. 242 (1874). *L. pardalinum*, var. *pallidifolium* Baker, l. c.—In the latest treatment of the Californian lilies, Jepson, Fl. Calif. i. 312

(1921), as well as in all other treatments since the Botany of California, ii. 166 (1880), the name *L. pardalinum* has been applied to lilies growing in both the Coast Ranges and in the Sierra Nevada of California, and by some even to lilies occurring in the mountains of Oregon and Washington. This wide use of the name seems unjustifiable since even a superficial study suffices to show that there are at least two quite distinct forms now included under Kellogg's name. The plants of the Coast Ranges, and perhaps also of the northern Sierran foothills, are larger-flowered than the other plants referred to the species, and have coarser pedicels, larger linear versatile anthers, and perianth-segments whose outer half is a bright orange-red. This large-flowered plant has the corolla-structure of *L. Humboldtii* Roezl & Leicht., but in other than these structures it is quite distinct, having differently colored somewhat smaller flowers, and a totally different bulb. The plant which is frequent in wet places in the Sierra Nevada and is at present going under the name, *L. pardalinum*, differs from the Coast Range lily in being smaller in all parts, having yellow or orange corollas, and short oblong usually erect non-versatile anthers. This Sierran plant strikingly simulates *L. columbianum* Hans. of the Northwest, from which it is primarily separated by its bulb, the Californian plant having a small rhizomatose bulb with jointed scales, whereas *L. columbianum* has a solitary bulb twice as large and one with simple triangular or lanceolate scales.

The correct application of *L. pardalinum* Kell. is readily determined by a study of Kellogg's original description and plate (plate reproduced in Bull. Calif. Acad. i. 149 (1885)). There can be no doubt that Kellogg originally described the large-flowered Coast Range plant. It is this form that has been illustrated by Regel, Gartenfl. xix. 321, t. 667 (1870); by Elwes, Monog. Lilium t. 28–29 (1877); by Waugh, Bot. Gaz. xxvii. 346, f. 12 (1899); and by Hall & Hall, Fl. Yosemite, pl. opp. pg. 56 (1912). The yellow-flowered Sierran plant appears to have been illustrated only by Armstrong, West. Wild Fl. 37 (1915), who has only one (the upper) of two corollas well represented. The Sierran plant seems best called

LILIUM PARDALINUM, var. PARVIFLORUM Eastw. Publ. Sierra Cl. no. 27, 14 (1902). Bulbs rhizomatous with jointed scales; stems 6–12 dm. high; leaves scattered or in definite whorls of 4–14, linear to lanceolate, becoming 14 cm. long and 25 mm. wide, glabrous; flowers one to many, terminal or loosely racemose; pedicels 6–15 mm. long usually spreading and nodding just below the corolla; perianth-lobes orange or yellow, lower half spotted with purple, 4–5 cm. long. 8–14 mm. wide.

erect for 10–15 mm. then strongly recurved; anthers oblong, 4–7 mm. long, 1.5–2 mm. wide, usually erect, appearing basifixed.—The above varietal name was originally applied to a local small-flowered variant of the Sierran plant, but its limits are here amplified to include all of the Sierran tiger-lilies. This Sierran lily is given only varietal rank since Dr. H. M. Hall assures me that there is a specimen in the University of California Herbarium which combines the characters of the Sierran and Coast Range forms. This specimen, Univ. Calif. Herb. 68,798, comes from the Mt. Pinos Region where intergrades are to be expected. From the material in the Gray Herbarium alone the Sierran and Coast Range lilies seem sharply distinct and worthy of specific separation. The variety *parviflorum* differs from genuine *L. pardalinum* in range, in having the perianth-segments 4–6 cm. long and entirely yellow or orange and not 6–8 cm. long with the outer half conspicuously orange-red, and in having oblong non-versatile usually erect anthers 4–7 mm. long rather than linear versatile ones 9–14 mm. long. It ranges from Tulare County in the southern Sierra Nevada of California, northward into southern Oregon. Forms of it are apparently the basis for many, if not all, the Californian records of *L. columbianum*. The latter species ranges from British Columbia and Idaho southward to middlewestern Oregon where it is replaced by, or perhaps even grades into, *L. Howellii*. Hansen, Erythea vii. 21 (1899), has given a pleasing account of the habits of the plant here called *Lilium pardalinum*, var. *parviflorum*.

Alternanthera nesiotes, sp. nov., prostrata; caulibus teretibus gracilibus ca. 1 dm. longis e radice perenni crassa orientibus; foliis orbicularibus vel ovatis integerrimis 6–8 mm. longis 4.5–6 mm. latis dense villoso-strigosis, juvenibus sparse strigosis viridibus supra venis impressis; floribus brunescentibus in glomerulos sessiles axillares dense congestis cum capillis longis tenuissimis albis intermixtis; bracteis bracteolisque acuminatis oblongo-lanceolatis quam sepala tertiam partem brevioribus; sepalis ovato-oblongis 2–2.5 mm. longis valde 3-nervatis acutis vel breviter acuminatis; filamentis staminodiisque subulatis tubo longioribus; stylo quam ovarium multo breviori; utriculo ovoideo.—GALAPAGOS ARCHIPELAGO: Occasional among rocks near shore of Cormorant Bay, Charles Island, *Stewart 3154* (TYPE, Gray Herb.). This is a very distinct member of *Alternanthera* and apparently without any close described relative. In gross aspect the plant much suggests a species of *Guilleminia*. The type-collection, distributed as *Coldenia fusca* Hook. f., bears on its label the locality "Connerant Bay".

PICKERINGIA MONTANA Nutt. in T. & G. Fl. N. A. i. 389 (1840). *Xylothermia montana* Greene, Pittonia ii. 188 (1891).—The generic name "*Pickeringia*" was used twice by Nuttall, once in 1834, Jour. Philad. Acad. vii. 95, for a member of the *Myrsinaceae*, and again in 1840, l. c., for a leguminous plant. Although only the later homonym had been recognized, Greene, l. c., held it non-valid and proposed in 1891 the substitute name *Xylothermia*. The earlier *Pickeringia* was at one time maintained by the elder DeCandolle, Prodr. vii. 733 (1839), as a dubious member of the *Ericaceae*, but was subsequently referred by his son, Prodr. viii. 123 (1844), to synonymy under *Ardisia* where all subsequent writers have been content to leave it. Although Greene suggested that future writers would find the earlier *Pickeringia* to be worthy of generic recognition, it is significant that neither Mez, Pflanzenr. iv. Fam. 236, 57 (1902), who recently monographed the family, nor even Small, Fl. S. E. United States ed. 2, 907 (1913), or Britton and Millspaugh, Bahama Fl. 315 (1920), with their narrow generic concepts, have found it at all advisable to resurrect the older Nuttallian genus. As the *Pickeringia* of 1834 is universally recognized as non-valid the homonym of 1840 is here maintained in accordance with Article 50 of the International Rules of Nomenclature. The proper combination for the following well marked geographical variety seems never to have been made.

Pickeringia montana Nutt., var. **tomentosa** (Abrams), comb. nov. *Xylothermia montana*, subsp. *tomentosa* Abrams, Bull. Torr. Cl. xxxiv. 263 (1907).—Although very positive in its single character—its copious pubescence—the present variety seems identical with the typical form of the species in all other respects. It is the southern phase of the species, replacing it in the mountains of San Bernardino and San Diego counties of California.

Adenopeltis serrata (Ait.), comb. nov. *Excoecaria serrata* Ait. Hort. Kew ed. 2, v. 418 (1813). *Adenopeltis Colliguaya* Bert. in Juss. Ann. Sci. Nat. xxv. 24 (1832).

Astrocasia (?) **populifolia**, sp. nov., dioecia glaberrima fruticosa 9–12 dm. alta; foliis reniformibus vel orbicularibus vel ovatis 20–43 mm. longis 20–35 mm. latis integerrimis firmis subtus pallidioribus apice rotundatis basi rotundatis vel cordatis angustissime peltatis, petiolis teretibus 6–25 mm. longis; floribus ignotis; pedicello fructifero gracili tereti saepe reflexo 2–4 cm. longo; capsula depressa triloba 4–6 mm. alta ca. 1 cm. lata reticulata in coccos bivalves dissiliente; columella persistente; seminibus in quoque loculo geminis brunneis lateraliter compressis plano-convexis late ovatis 4–5 mm. longis ca.

4 mm. latis ecarunculatis ventraliter sulcatis; albumine dure carnoso; cotyledonibus tenuibus latis planis; radicula cylindrica.—MEXICO: Jaumave Valley, Tamaulipas, ca. 2000 ft., 1898, *Nelson 4455* (TYPE, Gray Herb.). Vicinity of Palmilla, Tamaulipas, 1830, *Berlandier 796, 2216*. En route from San Luis Potosi to Tampico, 1878–9, *Palmer 1140*. An anomalous species of doubtful affinities which is only provisionally referred to *Astrocasia*. No flowering specimens of *A. populifolia* have been seen by me. I am refering the Mexican species to *Astrocasia* because in that genus alone among the American *Phyllanthoideae* do I find a broad-leaved dioecious shrub with similar very long fruiting pedicels and essentially similar capsules and seeds. A careful search through the literature and in the Gray Herbarium has not only failed to discover any close relative of *A. populifolia*, but any previous mention of it as well. I am inclined to believe that the discovery of staminate flowers will reveal the species to be a monotype. In outline, the leaves of *A. populifolia* suggest those of an aspen or of some of the broader-leaved Jatrophas related to *J. canescens* (Benth.) Müll.

Cnidoscolus inermiflorus, sp. nov., fruticosus; petiolis puberulentis 5–14 cm. longis; laminis foliorum 8–12(–18) cm. longis ca. 10(–17) cm. latis puberulentis membranaceis irregulariter acuteque dentatis longe setosis elobatis vel 3–5-lobatis, basi profunde cordatis; pedunculis 10–18 cm. longis ad apicem dense puberulentis vel velutinis; cymis corymbiformibus parce stimulosis, bracteis lineari-lanceolatis inferioribus 12 mm. longis; calyce extus velutino-pubescenti estimuloso 10–13 mm. longo, lobis ovatis obtusis tubo dimidio brevioribus, disco annulari glabro, columna staminali 4–5 mm. alta basi villosa; staminibus fertilibus 2-verticillatis 10, sterilibus 3.—MEXICO: Along road over mountains between Victoria and Jaumave Valley, Tamaulipas, 1898, *Nelson 4439*. Vicinity of Victoria, Tamaulipas, 1907, *Palmer 140* (TYPE, Gray Herb.). A very distinct species of doubtful relationship. Probably nearest *C. tubulosus* (Müll.) Johnston, from which it differs in its setose-margined entire or broadly lobed leaves, larger staminate flowers, and villous staminal tube.

Cnidoscolus Pringlei, sp. nov., glaber dense stimulosus; petiolis 4–10 cm. longis stimulosis; laminis foliorum 8–10 cm. latis 6–8 cm. longis rotundato-reniformibus ad 1/3 longitudinis 3- vel 4-lobis basi cordatis, lobis grosse inciso-dentatis parce stimulosis; cymis pedunculatis modice laxifloris corymbiformibus; calyce albo infundibuliformi parce stimuloso puberulento 8–10 mm. longo ad mediam partem vel ultra tubulato, lobis obovatis obtusis, disco annulari glabro,

columna staminali 5 mm. alta basi villosissima; staminibus fertilibus 2-verticellatis 10 filiformibus; capsula 8 mm. longa stimulosa; seminibus pallidis 8 mm. longis; carunculis lutescentibus.—MEXICO: Baranca near Guadalajara, Jalisco, 1886, *Palmer 141* (TYPE, Gray Herb.). Hills near Iguala, Guerrero, 3000 ft., 1907, *Pringle 10,387*. Related to *C. angustidens* Torr. of northwestern Mexico and adjacent United States, but differing in its remote southern range, less prolonged toothing on the firmer leaves, smaller capsules, lighter-colored seeds, more densely villous staminal tube, and longer filaments.

Cnidoscolus aconitifolius (Mill.), comb. nov. *Jatropha aconitifolius* Mill. Gard. Dict. ed. 8 (1768).

Cnidoscolus albomaculatus (Pax), comb. nov. *Jatropha albomaculata* Pax, Pflanzenr. iv. Fam. 147, i. 90 (1910).

Cnidoscolus calyculatus (Pax & Hoffm.), comb. nov. *Jatropha calyculata* Pax & Hoffm. Pflanzenr. iv. Fam. 147, i. 97 (1910).

Cnidoscolus cordifolius (Pax), comb. nov. *Jatropha cordifolia* Pax, Pflanzenr. iv. Fam. 147, i. 107 (1910).

Cnidoscolus herbaceus (L.), comb. nov. *Jatropha herbacea* L. Sp. Pl. 1007 (1753).

Cnidoscolus loasoides (Pax), comb. nov. *Jatropha loasoides* Pax, Pflanzenr. iv. Fam. 147, i. 92 (1910).

Cnidoscolus longipes (Pax), comb. nov. *Jatropha longipes* Pax, Pflanzenr. iv. Fam. 147, i. 106 (1910).

Cnidoscolus multilobus (Pax), comb. nov. *Jatropha multiloba* Pax, Pflanzenr. iv. Fam. 147, i. 107 (1910).

Cnidoscolus platyandrus (Pax), comb. nov. *Jatropha platyandra* Pax, Pflanzenr. iv. Fam. 147, i. 110 (1910).

Cnidoscolus polyanthus (Pax & Hoffm.), comb. nov. *Jatropha polyantha* Pax & Hoffm. Pflanzenr. iv. Fam. 147, i. 105 (1910).

Cnidoscolus tenuifolius (Pax & Hoffm.), comb. nov. *Jatropha tenuifolia* Pax & Hoffm. Pflanzenr. iv. Fam. 147, i. 107 (1910).

Cnidoscolus tubulosus (Müll. Arg.), comb. nov. *Jatropha tubulosa* Müll. Arg. Linnaea xxxiv. 212 (1865).

Ditaxis sinaloae, sp. nov., monoecia perennis ca. 35 cm. alta basem versus suffruticosa; caulibus simplicibus paucis herbaceis 2–3 dm. longis erectis dense sericeo-strigosis conspicue sulcatis; foliis ovatis vel oblongis 4–8 cm. longis 25–45 mm. latis conspicue denticulatis apice breviter acuminatis basi subacutis supra viridibus et sparse villosis infra villoso-tomentosis et canescentibus, petiolis brevissimis 1–4 mm. longis; floribus in glomerulos axillares subsessiles congestis; floribus masculis 4–5-meris, sepalis acutis lanceolatis 1 mm. latis ca.

4 mm. longis extus villosis, petalis ovato-lanceolatis acutis 2 mm. latis 4–5 mm. longis quam sepalae saepe paulo longioribus extus villosis intus glabris ad columnam paullo supra basem adfixis, disco glandulari vix distincto per totam longitudinem columnae adnato, staminibus 10 biseriatis; floribus femineis 5-meris basi glomerulae solitariter adfixis, sepalis maturitate lanceolatis 7 mm. longis extus villosis, petalis lineari-lanceolatis ca. 4 mm. longis, lobis disci glandularis ovatis vel deltoideis glabris; capsulis villosis ca. 4 mm. crassis; seminibus pallidis ovoideis reticulatis ca. 2 mm. longis.—MEXICO: Culiacan, Sinaloa, 1891, *Palmer 1462* (TYPE, Gray Herb.). This species belongs to *Ditaxis* § *Anacanthium* as that section is defined by Pax and Hoffmann, Pflanzenr. iv. Fam. 147, vi. 58 (1912), and to the same immediate group of species as *D. tinctoria* (Millsp.) Pax & Hoffm. and *D. manzanilloana* Pax & Hoffm. *Ditaxis sinaloae* differs from both the species mentioned in its coarse stems, large leaves, and different range. It differs from *D. tinctoria* in its lack of dye-stained tissue, longer broader staminate sepals, glabrous stamens, more elongate pistillate sepals, and less developed pistillate glands. From *D. manzanilloana* it differs in its larger flower-parts, and in the pubescence and shape of the pistillate sepals and corolla.

EUPHORBIA DEPPEANA Boiss. Cent. Euphorb. 6 (1860). *Anisophyllum californicum* Kl. & Gar. Abhandl. Akad. Wiss. Berlin 1859, 36 (1860).—Millspaugh, Publ. Field Mus. Bot. Ser. ii. 409 (1916), has indicated *E. Anthonyi* and *E. clarionensis* Brandg., Erythea vii. 7 (1899), two species endemic on the Revillagigedo Islands off the west coast of Mexico, as synonymous with the very obscure *E. Deppeana*. This procedure was no doubt due to a desire to associate the name with some west American plant because both *Euphorbia Deppeana* Boiss. and *Anisophyllum californicum* Kl. & Gar. are based upon a collection cited "In California (Deppe)." The relations of *E. Deppeana* are clearly within that peculiar group of shrubby species that Boissier, DC. Prodr. xv. pt. 2, 11 (1862), called the *Gymnadeniae*. That species can hardly be either *E. Anthonyi* or *E. clarionensis*, for it has according to Boissier, "involucris terminalibus solitariis breviter pedunculatis hemisphaericis . . . glandulis . . . exappendiculatis, ovario glabro." Brandegee's two species have on the other hand the small pubescent very numerous turbinate involucres in dense axillary clusters, glands that are somewhat appendaged, and the ovary very pubescent. As *E. Deppeana* seems very closely related to *E. Hookeri* Boiss, and to *E. multiformis* Gandg., it seems that like these species and their immediate relatives it is probably indigenous to the

Hawaiian Archipelago. As no plant approaching *E. Deppeana* has been discovered in either California or Mexico and as Deppe is known to have collected in the Hawaiian Islands, it seems more than probable that the plant in question was obtained in this Archipelago and that through some confusion of data the original collection was erroneously attributed to California. Highly suggestive if not indicative of confusion of data in the Deppe collections is the fact that the unmistakable *Aleurites moluccana* L., a tree unknown along the Pacific Coast of North America although very common in the Hawaiian Islands, is also reported, Pflanzenr. iv. Fam. 147, i. 131, from California upon the basis of a Deppe specimen.

Halliophytum, gen. Euphorb. nov. Flores dioici apetali. *Flores masculini* ad axilla fasciculati: Pedicelli longi graciles. Sepala 4–5 imbricata. Disci lobi 4–5 staminibus alterni. Stamina 4–5, filamentis liberis sepalis oppositis. Ovarii rudimentum evolutum 3-fidum. *Flores feminei* solitarii: Pedicelli breves validi. Ovarium 3-loculare. Styli distincti recurvi indivisi apice dilati. Ovula in loculis gemina. Capsula sicca in coccos 2-valves dissiliens. Semina oblonga strophiolata compressa testa granulata. Frutex rigide ramosus. Folia alterna parvula integerrima fasciculata oblanceolata. Plantae septentrionali-mexicanae et australi-californicae.—This proposed genus belongs to the *Euphorbiaceae-Phyllantheae*. It appears to be most nearly related to *Securinega* from which it differs by having large firm solitary capsules borne on short stout pedicels, and by having carunculate seeds which by abortion are usually solitary in each capsular cell. *Halliophytum* is also distinct in habit being composed of divaricately much branched very rigid desert shrubs which have small fasciculate oblanceolate leaves. The genus is named for Dr. H. M. Hall, formerly of the University of California but now of the Carnegie Institution, who in 1906 made the first collection of the Californian species during one of his many very fruitful collecting expeditions into the deserts of California. The following species are known.

✓ **H. fasciculatum** (Wats.), comb. nov. *Bernardia fasciculata* Wats. Proc. Am. Acad. xviii. 153 (1883). *Securinega fasciculata* Johnston, Univ. Calif. Pub. Bot. vii. 441 (1922).—MEXICO: Mts. 24 m. N. E. of Monclova, Coahuila, *Palmer 1233* (TYPE). Shrub 5 ft. high, plains S. W. of San Pablo, (?) Chihuahua, April 22, 1847, *Gregg*. Saucillo, Chihuahua, *Thurber 837*. Vicinity of Santa Rosalia, Chihuahua, *Palmer 384*.

H. Hallii (Brandg.), comb. nov. *Tetracoccus Hallii* Brandg. Zoe v. 229 (1906). *Securinega Hallii* Johnston, Univ. Calif. Pub. Bot. vii.

442 (1922).—CALIFORNIA: Cottonwood Springs, Eagle Mts., *Parish 10,844, 10,845.*

H. capense (Johnston), comb. nov. *Securinega capensis* Johnston, Univ. Calif. Pub. Bot. vii. 441 (1922).—MEXICO: Coast below Pescadero, Lower Calif., Sept. 23, 1893, *T. S. Brandegee.*

Jatropha arizonica, sp. nov., herbacea; rhizomatibus crassis carnosis; caulibus 1–4 dm. altis simplicibus glabris; petiolis 3–7 cm. longis; laminis foliorum basi subcordatis 5–10 cm. longis saepe profunde 5-lobatis, lobis arrectis lanceolatis setaceo-dentatis; stipulis 5–8 mm. longis setaceo-dissectis; cymis inter folia superiora breviter pedunculatis; bracteis setaceis; calycis 5–7 mm. longi lobis setaceis vel lanceolatis; corolla 6–10 mm. longa segmentis ad 7/8 longitudinis connatis glabris; glandulis liberis; columna staminali 6 mm. alta gracili glabra; staminibus fertilibus 2-verticillatis 10, sterilibus 0; capsula 10–12 mm. longa; seminibus 8 mm. longis pallidis vel lutescentibus, caruncula lacero-multifida.—ARIZONA: Foothills of Santa Rita Mts., 1882, *Pringle* (TYPE, Gray Herb.). Near Ft. Huachuca, 1882, *Lemmon 2871.* Ft. Huachuca, 1890, *Palmer 467.* Douglas, 1920, *W. W. Jones 202.* SONORA: Dry plains near San Bernardino, *Thurber 354.* Guadaloupe, May 1851, *Thurber 403.* CHIHUAHUA: Casas Grandes, 1899, *Goldman 429.* The plant concerned here is that northern one which has been called *Jatropha macrorhiza* Benth., a name which is properly restricted to a very differently appearing plant of central Mexico. The newly described plant differs from the genuine *J. macrorhiza* in its more northern distinct range, in its deeply lobed much toothed less firm leaves, and in its much more developed stipules. It seems very strange that two such distinct and manifestly different species should ever have been confused under one name.

Jatropha grandifrons, sp. nov., glabra; foliis grandibus, petiolis 15 cm. longis, laminis 2 dm. longis 17 cm. latis supra viridibus subtus pallidis marginibus sublobatis lobulis rotundatis capitato-glanduligeris, basi profunde cordata auriculata valde imbricata; cymis longe pedunculatis dichotome longirameis; sepalis floris pistillati 3 mm. longis ovatis obtusis basi connatis; corolla 6–8 mm. longa segmentis usque ad 4/5 longitudinis connatis; capsula 1 mm. longa.—MEXICO: Vicinity of Oaxaca, alt. 1550 m., 1901, *Conzatti & Gonzáles 1206* (TYPE, Gray Herb.). A very well marked species which is closely related to *Jatropha oliracea* Müll., but which differs from it by having leaves three or four times as large, less lobed, glabrous, and with the basal lobes strongly imbricated, and by having the peduncles of the inflorescence longer and the flowers averaging larger.

Macaranga Heynei, nom. nov. *Rottlera montana* Heyne in Wall. Cat. 272, no. 7833A (1848).—*M. montana* Pax & Hoffm. Pflanzenr., iv. Fam. 147, vii. 321 (1914); not *M. montana* Merr. Philipp. Jour. Sci., Bot. vii. 394 (1912).

Manihot mexicana, sp. nov., humilis fruticosa; ramis saepe glabris nigrescentibus; foliis palmatis fere ad basin lobatis 6–11 cm. latis supra viridibus infra pallidis; lobis 5 vel 7 lanceolatis ad apicem setigeris divergentibus duobus exterioribus brevibus; stipulis subulatis subpersistentibus; racemis paucifloris 4–6 mm. longis, bracteis subulatis deciduis; calycibus lutescentibus vel purpurascentibus pendulis 9–12 mm. longis glaberrimis; antheris 1.5–2 mm. longis 3-plo longioribus quam latis; capsulis rugosis globosis vel ovoideis ecostatis 10–11 mm. longis.—MEXICO: Hillsides of Zapotlan, Jalisco, alt. 5000 ft., 1905, *P. Goldsmith 120* (TYPE, Gray Herb.). Near Guadalajara, Jalisco, *Pringle 5159, 11318; Palmer 142, 156.* Guanajuato, *Dugès 8, 20, 203.* Without precise locality, 1848–49, *Gregg 198.* (?) Top of the ridge back of Tonala, Chiapas, 1895, *Nelson 2899.* This species has been confused with the closely related *Manihot angustiloba* (Torr.) Müll. It is readily separated from that species, however, by its southerly range, smaller bicolored leaves, more slender commonly purplish stems, and smaller less roughened fruit.

Manihot rubricaulis, sp. nov., fruticosa 12–15 dm. alta; ramis numerosis rubescentibus; foliis in parte superiori aggregatis, petiolis 4(–8) cm. longis, laminis profunde 5–7-partitis glabris concoloribus, lobis linearibus apice setaceis 4–9(–15) mm. latis acutis integris basi in disculum confluentibus duobus exterioribus minime divergentibus; stipulis subulatis inconspicuis; racemis 3–6 cm. longis, bracteis subulatis ca. 8 mm. longis, pedicellis erectis 4–10 mm. longis; calyce glabro glauco lutescente 10–13 mm. longo apud florem pistilliferum 5-lobato apud florem staminiferum 5-partito; antheris 2–3 mm. longis 4- vel 5-plo longioribus quam latis; capsulis verrucosis globosis ca. 12 mm. longis.—MEXICO: East slope of Iron Mt. near Durango, 1896, *Palmer 224* (TYPE, Gray Herb.). A very distinct species probably nearest to *Manihot mexicana* Johnston, from which it differs in its tall simple reddish shrubby stems, linear concolorous leaf-segments, and larger anthers.

Pachystroma longifolium (Nees), comb. nov. *Ilex longifolia* Nees, Flora 1821, pt. 1, 301 (1821). *P. ilicifolium* Müll. Linnaea xxxiv. 178 (1865). *P. ilicifolium* Müll., var. *longifolium* Müll. l. c.

Pera heteranthera (Schrank), comb. nov. *Spixia heteranthera* Schrank, Denkschr. Akad. München vii. 242 (1821). *S. Leandri*

Mart. Flora 1841, pt. 2, Beibl. 30 (1841). *P. Leandri* Baill.; Müll. in DC. Prodr. xv. pt. 2, 1027 (1862).

Sapium cremostachyum (Baill.), comb. nov. *Stillingia cremostachya* Baill. Adansonia v. 322 (1865). *Sapium biglandulosum*, var. *Klotzschianum* Müll. Linnaea xxxii. 117 (1863). *Sapium Klotzschianum* Huber, Bull. Herb. Boiss. ser. 2, vi. 438 (1906).

Stillingia texana, nom. nov. *Sapium sylvaticum*, var. *linearifolia* Torr. Bot. Mex. Bound. 201 (1859). *Stillingia sylvatica*, var. *linearifolia* Müll. in DC. Prodr. xv. pt. 2, 1158 (1862). *Stillingia linearifolia* Small, Fl. S. E. United States 704 (1903); not Watson, Proc. Am. Acad. xiv. 297 (1879).—The species here considered is that Texan plant which has gone under the name of *Stillingia angustifolia* Engelm., a name published in 1883 by Watson, Proc. Am. Acad. xviii. 154. If *S. angustifolia* is not at once to be rejected as a hyponym it must be taken as being based on the cited *Stillingia sylvatica*, var. *angustifolia* Müll. Müller's variety, however, was founded on two collections from Florida and is clearly the narrow-leaved southeastern phase of *Stillingia sylvatica*. Hence it is that "*Stillingia angustifolia* Engelm." is improperly applied to the common Texan species. Torrey, l. c., gave the first acceptable name to the Texan plant when he called it *Sapium sylvaticum*, var. *linearifolia*. In 1903 Small, l. c., raised Torrey's variety to specific rank, a legitimate step were it not for the fact that Watson in 1879 had applied the resulting binomial to a universally recognized Californian plant of the same genus. In 1912 Pax, Pflanzenr. iv. Fam. 147, v. 192, took up Small's combination and renamed the plant which Watson has christened *Stillingia linearifolia*. Such procedure, however, recognizes intercategorical priority, a principle contrary to the International Rules of Nomenclature. The Texan plant being without an acceptable name it is here called *Stillingia texana*. The Californian plant continues to be properly called *Stillingia linearifolia* Wats. while *Stillingia gymnogyna* Pax & Hoffm. falls as an absolute synonym of it.

Stillingia Treculiana (Müll.), comb. nov. *Gymnanthes Treculiana* Müll. Linnaea xxxiv. 216 (1865). *Stillingia Torreyana* Wats. Proc. Am. Acad. xiv. 298 (1879). *Sapium annuum*, var. *dentatum* Torr. Bot. Mex. Bound. 201 (1859). *Stillingia dentata* Britt. & Rusby, Trans. N. Y. Acad. vii. 14 (1887).

Tragia leptophylla (Torr.), comb. nov. *T. ramosa*, var. *leptophylla* Torr. Bot. Mex. Bound. 201 (1859). *T. stylaris*, var. *leptophylla* Müll. Linnaea xxxiv. 181 (1865).

Coldenia hispidissima (Torr.) Gray, var. **latior**, var. nov., foliis quam apud formam typicam latioribus non linearibus sed potius lanceolatis, lamina latitudine basin induratam expansam aequanti vel superanti 2–3 mm. lata.—UTAH: 1873, *Capt. Bishop*. ARIZONA: 1871, *Lieut. Wheeler*. 1877, *Palmer 343*. NEVADA: Muddy Valley, Lincoln County, *Kennedy & Goodding 79* (TYPE, Gray Herb.). Virgin River, *Goodding 706*. The variety *latior* includes those forms of the species which occur in Arizona, Utah, and Nevada, the northwest portion of the specific range as a whole. It is simply a well marked foliar variation.

Penstemon hians, sp. nov., glaber 6–9 dm. altus basem versus ramosus; caulibus erectis simplicibus; foliis firmiusculis viridibus vel glaucescentibus post exsiccationem languide viridibus 10–14 mm. latis 5–7 cm. longis basi in petiolum brevem attenuatis acute denticulatis, caulinis sessilibus cordatis ovato-lanceolatis dentatis in inflorescentiam extentibus et gradatim reductis; inflorescentia laxa pauciflora 3 dm. longa 7–8 cm. lata, ramis laxe ascendentibus 15–40 cm. longis a bracteis foliaceis suffultis, pedicellis gracilibus 10–25 (saepissime 15–20) cm. longis a bracteis herbaceis ovatis vel oblongis 4–6 mm. longis subtentis; calyce glabro vel puberulento, lobis imbricatis acutis ovatis 5 mm. longis; corolla 25–30 mm. longa alba caesio- et roseo-tincta, tubo 4–5 mm. longo et ca. 4 mm. crasso, faucibus perinflatis 12–15 mm. crassis patenter hiantibus, labio inferiori patenti 9–12 mm. longo intus conspicue barbato in 3 segmentis latis 3–4 mm. longis lobato, labio superiori erecto 2-lobato 8–11 mm. longo; stamine sterili conspicue exserto dense longeque flavo-barbata; staminibus fertilibus saepe inclusis glaberrimis; capsula ignota.—CALIFORNIA: San Benito River, San Benito County, May 25, 1915, *Hall 9924* (TYPE, Gray Herb.). Lewis Creek, San Benito County, May 14, 1893, *Eastwood*. This plant has gone as *P. Palmeri* Gray, but although belonging to the same immediate group of species it differs from the desert-inhabiting *P. Palmeri* in its very lax leafy inflorescence, very large stout corollas, and sparse narrow non-connate scarcely glaucous leaves. *Penstemon hians* is much nearer *P. Grinnellii* Eastw., a mountain species of Southern California, from which it differs in its slender taller stems, more open leafy non-glandular inflorescence, and very much larger more gaping bluish-tinged corollas. The newly described species seems to represent the *P. Palmeri* group in the South Coast Ranges of California.

During the examination of an interesting suite of *Hymenopappus*, sent to the Gray Herbarium by Mr. George Osterhout of Windsor,

Colorado, the problems in the classification of the genus became apparent and an attempt was made at solving them. The tangible result of this study is the subjoined synopsis of the genus. In the past much emphasis has been placed upon the relative length of corolla-lobes and corolla-tube, and upon the development of the pappus, two characters which from my study seem highly variable and hence poor specific indicators. In the present synopsis duration, pubescence, and leaf-lobing, are stressed, since they seem best to indicate the main specific tendencies. Except for overthrowing the monotypic genus *Leucampyx*, the genus *Hymenopappus* and immediate relatives are taken as defined by Rydberg, No. Am. Fl. xxxiv. 43–44 (1914). Certain authors have merged *Hymenothrix* into *Hymenopappus*, but such a step logically results in dragging down *Flouresia* also. As I am not certain that *Flouresia* is best treated as a part of *Hymenopappus* I am following the only natural alternative of recognizing *Hymenothrix* and *Trichymenia*. The generic lines as here taken are very weak and those that maintain them must find their arguments in precedence and convenience.

Plants biennial or annual; occuring east of continental divide.
Achene-faces not striate..... 1. *H. Palmeri.*
Achene-faces striate.
Leaf-segments broad, 2–4 mm. wide.
Tip of tegules white, at first conspicuously surpassing the disk..... 2. *H. scabiosaeus.*
Tip of tegules yellow, about equaling the disk.
Lower leaves as pinnatifid as upper ones..... 3. *H. corymbosus.*
Lower leaves less pinnatifid than upper ones.. 4. *H. artemisiaefolius.*
Leaf-segments very narrow, ca. 1 mm. wide.
Plant very canescent; leaf-segments usually crowded. 5. *H. robustus.*
Plant greenish; leaf-segments not crowded.
Achenes glabrate; tegules ovate, glabrate.... 6. *H. flavomarginatus.*
Achenes villous; tegules oblong, somewhat villous.
Tip of tegules conspicuously colored; forms of 3. *H. corymbosus.*
Tip of tegules inconspicuously colored..... 7. *H. tenuifolius.*
Plant perennial, multicipital; ranging along the Rocky Mts. and westward.
Leaves entire or simply pinnate with broad segments; achenes glabrate, stout..... 8. *H. mexicanus.*
Leaves at least bipinnate, segments linear-filiform; achenes villous.
Heads radiate.
Receptacle paleaceous.....9. *H. Newberryi.*
Receptacle naked.....10. *H. radiatus.*
Heads eradiate.
Stems scapose, cauline leaves much reduced and few.
Florets 30–40.....11. *H. gloriosus.*
Florets 15–25.....12. *H. lugens.*
Stems more or less leafy, cauline foliage little reduced.
Florets 10–15.....13. *H. pauciflorus.*

Florets 15–25.
Pinnules 1–2 mm. long, crowded, very canescent. . .14. *H. luteus.*
Pinnules 3–20 mm. long, remote, greenish. . . . . .15. *H. filifolius.*

1. HYMENOPAPPUS PALMERI (Gray) Hoffm. in E. & P. Nat. Pflanzenf. iv. Abt. 5, 256 (1890). *Hymenothrix Palmeri* Gray, Proc. Am. Acad. xxi. 391 (1886). *Hymenothrix glandulosa* Wats. Proc. Am. Acad. xxiii. 278 (1888). *Hymenopappus glandulosus* Rydb. No. Am. Fl. xxxiv. 48 (1914). *Hymenothrix glandulosa,* var. *Nelsonii* Greenm. Proc. Am. Acad. xl. 46 (1904). *Hymenopappus Nelsoni* Rydb. l. c. 49.—CHIHUAHUA: Parral to Batopsis, 1898, *Goldman 160.* Near Colonia Garcia, 1899, *Townsend & Barber 273; Nelson 6210* (type of *H. glandulosa,* var. *Nelsonii*). Above Canyon St. Diego, 1891, *Hartman 766.* Near Chihuahua, 1886, *Pringle 762.* Southwestern Chihuahua, 1886, *Palmer 395* (type of *H. Palmeri*). Sierra Madre, 1887, *Pringle 1293* (type of *H. glandulosa*). DURANGO: Sandia Station, 1905, *Pringle 13,559.* This species varies considerably in pappus and glandularity but shows no tendency to break up into geographically correlated variants.

2. H. SCABIOSAEUS L'Hér. Hymenop. 1 (1788). *Rothia caroliniensis* Lam. Jour. Hist. Nat. i. 17 (1792). *Hymenopappus caroliniensis* Porter, Mem. Torr. Cl. v. 338 (1894).—SOUTH CAROLINA: Aiken, 1869, *Canby.* GEORGIA: near Millen, 1901, *Harper 762.* FLORIDA: near Marianna, 1901, *Curtiss 6806.* Near Gainesville, *Curtiss 1508.* MISSISSIPPI: Columbus, 1896, *Tracy 1400.* ILLINOIS: Beardstown, 1842, *Geyer.* MISSOURI: Scott Co., 1894, *Eggert.*

3. H. CORYMBOSUS T. & G. Fl. N. Am. ii. 372 (1842). *H. Engelmannianus* Kunth, Ind. Sem. Hort. Berol. 15 (1848). *H. flavescens* Gray, Mem. Am. Acad. ser. 2, iv. 97 (1849). *H. sulphureus* Rydb. in Britt. Man. 1007 (1901). *H. Fisheri* Woot. & Standl. Contr. U. S. Nat. Herb. xvi. 191 (1913).—KANSAS: Riley Co., 1895, *Norton 285* (isotype of *H. sulphureus*). Hamilton Co., 1895, *Hitchcock 286.* ARKANSAS: *Dr. Learenworth* (isotype of *H. corymbosus*). OKLAHOMA: near Waynoka, 1913, *Stevens 5742.* Near Longdale, 1913, *Stevens 831.* TEXAS: San Antonio, May 1853, *Thurber.* Bracken, 1903, *Groth 90.* Weatherford, 1902, *Tracy 8544.* NEW MEXICO: 1847, *Fendler 464* (type of *H. flavescens*). Study of isotypic material of the poorly understood *H. corymbosus* clearly shows that the present usage of the name is correct. Gray's *H. flavescens* was based upon a good specimen of the present species collected by Fendler, and upon a few fragments, apparently of *H. artemisiaefolius,* which were collected by Wislizenus.

4. H. ARTEMISIAEFOLIUS DC. Prodr. v. 658 (1836).—TEXAS: Houston, *Bush 35; Lindheimer 107.* Without definite locality, *Drummond 182; Berlandier 349.* The exact relation of this species to *H. corymbosus* is uncertain. Perhaps *H. corymbosus* had best be made a variety of the present species.

5. H. ROBUSTUS Greene, Bull. Torr. Cl. ix. 63 (1882).—TEXAS: Toyah Creek, 1902, *Tracy & Earle 140.* Canyon City, 1901, *Eggert.* Frontera, *Parry 69.* El Paso, 1880, *Vasey.* NEW MEXICO: Hills towards the Gila, 1880, *Greene 104.* Santa Rita del Cobre, 1877, *Greene (22).* Betw. Ft. Wingate and Belen, 1880, *Rusby 180.* Silver City, *Eastwood 8530.* Without definite locality, *Wright 378, 1253, 1412.* ARIZONA: Catalina Mts., 1881, *Lemmon 218.* Camp 2, Rio Zuni, *Sitgreave Exped.* CHIHUAHUA: Near Paso del Norte, 1886, *Pringle 759.*

6. **H. flavomarginatus**, sp. nov., biennis e radice simplice oriens; caulibus erectis solitariis 6–10 dm. altis striatis sparse floccoso-tomentosis foliosissimis; foliis infra sparse tomentosis, supra glabratis, inferioribus bipinnatis ca. 6 cm. longis 2.5 cm. latis, superioribus pinnatis vix reductis, segmentis remotis angustis linearibus; inflorescentia laxe corymbosa; pedunculis 1–5 cm. longis dense tomentosis; capitulis 8–9 mm. altis; tegulis 8–10 glabratis ovatis vel orbiculari-ovatis flavescentibus medium et basem versus viridescentibus 5–7 mm. longis; flosculis flavis (?), 40–60, faucibus campanulatis, lobis deltoideis quam fauces 1/3 brevioribus, tubo villoso; achaeniis ca. 2.5–3 mm. longis glabratis transverse rugulosis quadrangularibus, faciebus lateralibus manifeste longitudinaliter costatis; pappo 1–0.3 mm. longo obscuro.—MEXICO: Sierra Madre south of Saltillo, Coahuila, 1880, *Palmer 650* (TYPE, Gray Herb.). The type of *H. flavomarginata* was determined by Gray as *H. flavescens*, but it is certainly distinct from that species differing conspicuously in its narrow leaf-segments and broad ovate tegules. It is probably most nearly allied to *H. robustus* from which it differs in its broad tegules, glabrate achenes, inconspicuous pappus, and green herbage.

7. H. TENUIFOLIUS Pursh, Fl. Am. Sept. ii. 742 (1814). *H. corymbosus*, var. *Nuttallii* T. & G. Fl. N. Am. ii. 372 (1842).—NEBRASKA: Long Pine, 1899, *Bates.* Neligh, 1906, *Bacon.* KANSAS: Ewing, 1899, *Bates.* Osborne City, 1894, *Shear 71.* Grove Co., 1895, *Hitchcock 287.* OKLAHOMA: Ft. Supply, 1882, *Potter.* Red River, *Nuttall* (isotype *H. corymbosus*, var. *Nuttallii*). TEXAS: Dallas, 1875, *Reverchon.* Baird, 1882, *Letterman.* COLORADO: near Cheyenne Wells, 1887, *Demetrio.* Apishipa Creek, *Osterhout 2043.* NEW MEXICO: North of Glorieta, 1908, *Standley 5233.*

8. H. MEXICANUS Gray, Proc. Am. Acad. xix. 29 (1883). *H. integer* Greene, Pittonia iii. 249 (1897). *H. obtusifolius* Heller, Bull. Torr. Cl. xxvi. 551 (1899). *H. petaloideus* Rydb. No. Am. Fl. xxxiv. 54 (1914).—NEW MEXICO: Mogollons Mts., 1881, *Rusby 179* (isotype of *H. integer*).. Pinos Altos Mts., 1880, *Greene*. Burro Mts., 1906, *Blumer 1848*. ARIZONA: Willow Springs, 1890, *Palmer 517*. Flagstaff, 1898, *MacDougal 240* (isotype of *H. obtusifolius*). Chiricahua Mts., 1907, *Blumer 2215*. Marshall Gulch, Catalina Mts. 1917, *Shreve 5399*. SAN LUIS POTOSI: Minas de San Rafael, 1911, *Purpus 4772a*. Mountains near San Miguel, 1876, *Schaffner 348* (type of *H. mexicanus*). CHIHUAHUA: Colonia Garcia, 1899, *Nelson 6109*. Base of Sierra Madre, 1887, *Pringle 1308*. GUANAJUATO: Guanajuato, 1883, *Dugès*. This plant varies in foliage from entire to simply pinnate, doing it so gradually that the designation of even *formae* seems inadvisable.

9. **H. Newberryi** (Gray), comb. nov. *Leucampyx Newberryi* Gray in Porter & Coulter, Synop. Fl. Colo. 77 (1874).—COLORADO: La Pagosa, 1860, *Newberry* (type). Pagosa Springs, 1899, *Baker 692*. Soda Springs 35 mi. W. of Canyon City, 1872, *Porter*. Hardscramble Canyon, 1874, *Brandegee 294*. Near Elliott Creek, Mineral Co., 1911, *Murdoch 4623*. NEW MEXICO: Winsor's Ranch, San Miguel Co., 1908, *Standley 4003*. *Hymenopappus radiatus* and *Leucampyx Newberryi* seem so closely and unmistakably related that it seems highly artificial to keep them generically separated. Consequently, as the reference of *H. radiatus* to *Leucampyx* would leave that latter genus without any characters, *L. Newberryi* is referred to *Hymenopappus*. The presence of palea in *H. Newberryi* may be looked upon as an atavism and consequently of merely specific significance. *Hymenopappus Newberryi* ranges from southwestern Colorado into northern New Mexico and differs from its relative, which occurs in southeastern Arizona and adjacent New Mexico, almost entirely in its possession of palea.

10. H. RADIATUS Rose, Contr. U. S. Nat. Herb. i. 122 (1891).—ARIZONA: Willow Springs, 1890, *Palmer 615* (isotype).

11. H. GLORIOSUS Heller, Bull. Torr. Cl. xxvi. 551 (1899). *H. scaposus* Rydb. Bull. Torr. Cl. xxvii. 634 (1900). *H. nudatus* Woot. & Stand. Contr. U. S. Nat. Herb. xvi. 191 (1913).—TEXAS: (?) Town Creek, Randall Co., 1901, *Eggert*. NEW MEXICO: Santa Fe, 1897, *Heller 3555*. Burro Mt., 1903, *Metcalfe 107* (isotype of *H. nudatus*). Silver City, 1919, *Eastwood 8402*. ARIZONA: Catalina Mts., 1881, *Lemmon 217*. Flagstaff, 1898, *MacDougal 129* (isotype of *H. scap-*

osus). About Mormon Lake, 1898, *MacDougal 71* (isotype of *H. gloriosus*). Grand Canyon, 1915, *Macbride & Payson 969*. UTAH: Richfield, 1875, *Ward 168*. IDAHO: Mackay, 1911, *Nelson & Macbride 1561*. Challis Creek, 1916, *Nelson & Macbride 3338*. OREGON: Burns-Prineville road of Crook Co., 1901, *Cusick 2631*. WASHINGTON: Touchet, 1883, *Brandegee 903*. The last four specimens have glabrate involucres and perhaps represent a distinct form. *Hymenopappus gloriosus* seems to be merely a many-flowered phase of the next species.

12. H. LUGENS Greene, Pittonia iv. 43 (1899). CALIFORNIA: Bear Valley, *Parish 3717; Abrams 2899*. Upper Santa Ana Canyon, 1906, *Hall 7507*. Near Cuyamaca Lake, 1917, *Spencer 597*. Near Julian, 1880, *Parish 238*. Cordilleras behind San Diego, *Parry*. LOWER CALIFORNIA: Tantillas Mts., 1875, *Palmer*.

13. **H. pauciflorus**, sp. nov., perennis; caulibus pluribus gracilibus sparse tomentosis 15–30 cm. altis simplicibus vel rare supra ramosis foliosis basem versus frutescentibus; foliis canescentibus 5–7 cm. longis 10–15 mm. latis, lobulis pergracilibus, foliis inferioribus bipinnatis, caulinis pinnatis; inflorescentia paucicapitulata; pedunculis saepe vix 1 cm. rare 5 cm. longis; tegulis oblongis late acutis 7–10 sparse tomentosis; flosculis flavis 9–15, faucibus campanulatis, lobis triangularibus quam fauces 2/3–1/2 brevioribus, tubo villoso; achaeniis villosis 3.5 mm. longis, pappo conspicuo, squamellis oblongis 0.5–1 mm. longis.—UTAH: Along San Juan River near Bluffs, *Rydberg & Garrett 9951* (TYPE, Gray Herb.). ARIZONA: Colorado Chiquito, May 1858, *Newberry*. Navaho Reservation, 1916, *Vorhies 130*. Related to *H. filifolius* but differing in lower, more slender habit and few-flowered heads.

14. H. LUTEUS Nutt. Trans. Am. Philos. Soc. ser. 2, vii. 374 (1841). —Rocky Mts., *Nuttall* (isotype). Green River, Wyo., 1897, *Nelson 3051*. Perhaps only a depauperate plateau phase of the next.

15. H. FILIFOLIUS Hook. Fl. Bor. Am. i. 317 (1834). *H. tomentosus* Rydb. Bull. Torr. Cl. xxvii. 633 (1900). *H. ochroleucus* Greene, Pl. Baker, iii. 30 (1901). *H. eriopodus* Nels. Bot. Gaz. xxxvii. 274 (1904). *H. columbianus* Rydb. No. Am. Fl. xxxiv. 52 (1914). *H. niveus* Rydb. l. c.—NEBRASKA: Near Thedford, 1893, *Rydberg 1321*. Central Nebraska, 1873, *Pruddin*. Upper Missouri, 1874, *Coues*. COLORADO: Cimarron, 1901, *Baker 269*. Naturita, 1914, *Payson 365*. UTAH: Diamond Valley, 1902, *Goodding 880* (isotype of *H. eriopodus*). St. George, 1877, *Palmer 270* (isotype of *H. tomentosus*). NEVADA: Lee Canyon, Charleston Mt., 1913, *Heller 11017*. Pahranagat Mt.,

1871, *Searls*. Las Vegas, 1905, *Goodding 2287*. Oregon: Muddy, 1885, *Howell 447*. John Day River, 1897, *Cusick 1692*. Washington: Morgan's Ferry, 1884, *Suksdorf 373*. Near Moses Lake, 1893, *Sandberg & Leiberg 375* (isotype of *H. columbianus*). Sentinel Bluffs, 1903, *Cotton 1366*. Hooker's name has been usually applied to plants growing along the east base of the Rocky Mountains, but a study of the original diagnosis shows clearly that the name was originally applied to the tall-growing tomentose plant of the Columbia River Valley which Rydberg has described as *H. columbianus*. It seems probable that *H. filifolius*, as here taken, is an aggregate since the available material comes from three distinct regions.

15a. **H. filifolius**, var. **cinereus** (Rydb.), comb. nov. *Hymenopappus cinereus* Rydb. Bull. Torr. Cl. xxvii. 634 (1900). *H. arenosus* Heller, Bull. Torr. Cl. xxv. 200 (1898). (?) *H. parvulus* Greene, Pl. Baker, iii. 30 (1901). (?) *H. polycephalus* Osterh. Torreya xviii. 90 (1918).—Alberta: Milk River, 1895, *Macoun 10937*. North Dakota: Bad Lands, Little Missouri, 1883, *Manly*. Montana: Gallatin City, 1883, *Lawson-Scribner 111a*. Bannack, 1880, *Watson 220*. Wyoming: Sybille Hills, 1894, *Nelson 328*. Ft. Laramie, 1901, *Nelson 8310*. Chug Creek, 1900, *Nelson 7360*. Forte Steele, 1900, *Nelson 7150*. Colorado: Gann, 1920, *Osterhout & Clokey 3952*. Denver, 1920, *Clokey 3951*. Near Livermore, 1917, *Osterhout 5680* (isotype of *H. polycephalus*). Twin Lakes, 1872, *Porter*. Arboles, 1899, *Baker 688*. Paradox, 1912, *Walker 78*. New Mexico: Near Espanola, 1897, *Heller 3542* (isotype of *H. arenosus*). Laguna, 1884, *Lemmon 3261*. Although the plant here called *H. filifolius*, var. *cinereus* seems distinct enough from *H. filifolius*, I have been unable to detect any characters which would be diagnostic even in a majority of cases. *Hymenopappus parvulus* is referred here with great doubt and I am inclined to believe that it probably is specifically distinct as it differs from the variety *filifolius* in its subscapose habit and small heads. *Hymenopappus polycephalus* is a puzzling form which suggests a perennial phase of *H. tenuifolius*. The variety *cinereus* differs from the genuine *filifolius* in its lower more compact habit, and slender less pubescent stems.

Gnaphalium nubicola, sp. nov., perenne?; caulibus e caudice brevi suffruticoso orientibus erectis vel ascendentibus foliosis tomentosis; foliis oblongo-obovatis late adfixis decurrentibus laxe tomentosissimis sed aetate aliquando sparsius vestitis 2–3 cm. longis 6–10 mm. latis superioribus vix brevioribus; capitulis 5–6 mm. altis 4–5 mm. diametro in glomerulos densos lanuginosos solitarios vel sub-

corymbosos congestis; tegulis ca. 18 brunneis et albidis 2-seriatis, exterioribus ovatis acutis, interioribus oblongis rotundatis mucronatis; floribus perfectis 5–6 ca. 2.5 mm. longis, imperfectis 30–40; pappi setis distinctis solitariter deciduis ca. 14 scabratis 2.5 mm. longis; achaeneis oblongis glabris brunnescentibus 0.6 mm. longis.—MEXICO: Near timber-line on Mt. Ixtaccihuatl, 1905, *Purpus 1524* (TYPE, Gray Herb), *1528*. Related to *Gnaphalium volcanicum* Johnston, but readily distinguished from that species by its obtuse bicolored tegules.

Gnaphalium sonorae, sp. nov., perenne; caulibus compluribus erectis tomentosis 2–3 dm. altis apicem versus ramosis; foliis integerrimis tomentosis supra viridioribus acutis basi late adfixis, inferioribus oblongo-oblanceolatis 20–35 mm. longis 5–8 mm. latis, superioribus lineari-oblongis 1–2 cm. longis; inflorescentia corymbosa conspicue foliosa; capitulis in glomerulos paucifloros congestis cylindratis 3 mm. latis 5 mm. longis basem versus laxe lanuginosissimis; tegulis albis 3-seriatis, exterioribus acutis oblongo-ovatis, interioribus rotundatis vel acutis lanceolato-oblongis; floribus 50 vel paucioribus, hermaphroditis 3.5 mm. longis 5–6; pappi setis antrorse hispidulis; achaeniis glabris 0.6 mm. longis oblongis.—MEXICO: Hermosillo, Sonora, 1888, *M. A. Crawford* (TYPE, Gray Herb.). Related to *Gnaphalium Wrightii* Gray, and to *G. microcephalum* Nutt., but readily distinguished from both by its less crowded heads and much looser leafy corymbs.

Gnaphalium rosaceum, sp. nov., annuum; caulibus erectis simplicibus dense villoso-strigosis 2–3 dm. altis; foliis oblanceolatis apice rotundatis vel late acutis 15–35 mm. longis 4–8 mm. latis integerrimis, supra sparse tomentosis viridibusque infra pallidis et dense sericeo-tomentosis, superioribus gradatim diminuatis; capitulis rosaceis 3.5 mm. longis 2 mm. latis in glomerulos axillares congestis spicam infra interruptam formantibus; tegulis 2-seriatis ca. 18, exterioribus ovatis acuminatisque, interioribus lineari-oblongis acutisque; floribus perfectis 2 mm. longis 4, imperfectis ca. 50; pappi setis ad basem connatis 15 scabris.—MEXICO: Region of San Luis Potosi, 1878, *Parry & Palmer 426* (TYPE, Gray Herb.). In the mountains near Morales, San Luis Potosi, 1876, *Schaffner 224* in pt. Santiago Papasquiara, Durango, 1896, *Palmer 66*. Belonging to the *Gnaphalium purpureum*-group in which it is characterized by its strict simple annual stems, and dense spicate inflorescence of rose-colored heads.

Gnaphalium pedunculosum, sp. nov., annuum; caulibus erectis 2–3 dm. altis villoso-strigosis vel floccosis simplicibus vel saepe ramosis-

simis, ramis strictis; foliis spathulatis vel lineari-oblanceolatis 10–35 mm. longis 2–5 mm. latis concoloribus vel supra viridioribus; capitulis 4–5 mm. altis 3–4 mm. latis in glomerulos dense foliosos hemisphaericos terminales vel in pedunculis brevibus axillaribus elevatos congestis; tegulis 3-seriatis ca. 20, exterioribus ovatis acuminatis, interioribus lineari-oblongis obtusis; floribus hermaphroditis 4–5 ca. 2.5 mm. longis, imperfectis ca. 50; pappi setis ca. 6 basi connatis 2.5 mm. longis.—MEXICO: Otinapa, Durango, 1906, *Palmer 411* (TYPE, Gray Herb.). Fields, Serrania de Ajusco, Federal District, 9000 ft. alt., 1896, *Pringle 6502*. In mountains near Morales, San Luis Potosi, 1876, *Schaffner 224* in pt. This has been confused with *Gnaphalium purpureum* L. but it is probably more closely related to *G. spathulatum* Lam. The newly described species is well marked by its strict growth and interrupted inflorescence composed of capitate pedunculate glomerules.

Gnaphalium stagnale, sp. nov., annuum; caulibus paucis vel multis gracilibus decumbentibus vel ascendentibus 5–20 cm. longis tomentosis laxe ramosis; foliis oblanceolatis 10–25 mm. longis 2.5–7 mm. latis apice mucronatis rotundatis vel late acutis, superioribus paulo brevioribus; capitulis 2.5–3 mm. longis 2–2.5 mm. crassis glomerulatis inflorescentiam cylindratam vel pyramidatam 2–3 cm. longam formantibus; tegulis ca. 16–20 triseriatis, exterioribus ovatis acutisque, interioribus lineari-oblongis obtusis roseis; floribus perfectis 2 mm. longis ca. 3, imperfectis ca. 50; pappi setis 15–18 ad basem connatis scabrosis; achaeniis oblongis glandulosis 0.6 mm. longis.—MEXICO: Marshes about San Luis Potosi, Aug. 1876, *Schaffner 225* (TYPE, Gray Herb.). Region of San Luis Potosi, 1878, *Parry & Palmer 425*. States of Coahuila and Nuevo Leon, 1880, *Palmer 2072*. Wet soil, Jalapa, Vera Cruz, *Pringle 8468*. Although this species has been confused with both *Gnaphalium americanum* Mill. and *G. purpureum* L., it differs from both in its small heads, more lax inflorescence, and conspicuously in its low diffuse habit of growth. It appears to frequent low ground.

Gnaphalium vulcanicum, sp. nov., annuum; caulibus simplicibus erectis vel ad basem ramosis tomentosis foliosis 2–3 mm. crassis 15–30 (saepius ca. 20) cm. altis, lateralibus paucis basem versus laxe ascendentibus; foliis concoloribus integerrimis sparse tomentosis, primis spathulatis vel oblanceolatis ca. 5 cm. longis 9–13 mm. latis, caulinis numerosis ascendentibus linearibus vel oblanceolatis acutis late adfixis vel subdecurrentibus; capitulis 6–7 mm. altis 6 mm. crassis in glomerulos densos lanuginosos solitarios vel subcorymbosos

congestis; tegulis 3-seriatis ca. 20 concoloribus hepaticis vel stramineis conspicue acutis, exterioribus ovatis; floribus perfectis 3 mm. longis 5–11, imperfectis 3 mm. longis ca. 50; pappi setis distinctis solitariter deciduis scabratis 4 mm. longis; achaeniis oblongis glabris brunnescentibus ca. 0.6–0.8 mm. longis.—MEXICO: Grassy slopes near timber-line on Nevado de Toluca, 1892, *Pringle 4232*. Mt. Popocatepetl, alt. 8000–9000, ft. *Schaffner 50*. Near timber-line on Popocatepetl, 1908, *Purpus 1529, 3033, 3644*. Rocks near timber-line on Ixtaccihuatl, 1905, *Purpus 1521, 1529*. Sides of Orizaba, 1901, *Rose & Hay 5777*. Mt. Orizaba, alt, 14,000 ft., 1891, *Seaton 242*. Near timber-line on Citlaltepetl (Mt. Orizaba), 1907, *Purpus 2782* (TYPE, Gray Herb.). Orizaba, 14,000–15,300 ft. alt., *Liebmann 319*. Cuchilla, n. e. side of Volcano of Colima, alt. 10,000 ft., 1905, *Goldsmith 63*. Without locality, *Coulter 451*. The present species is related to *G. brachypterum* DC. which differs in being a perennial with tufted rank loosely branched stems 4–7 dm. high, and in having contrastedly bicolored leaves the upper surface of which is green and glabrous and the lower surface white with a close floccose tomentum. *Gnaphalium brachypterum* ranges widely over Mexico at low altitudes, but *G. vulcanicum* appears to be restricted to the area near timber-line on the high volcanic cones which dominate southern Mexico. Practically all the material cited above has been distributed under one of the unpublished herbarium names of Schultz Bipontinus. As this name, an adjective formed from the noun Popocatepetl, is long and cumbersome a shorter name is associated with the species in publishing it.

Eremonanus, gen. *Compositarum* ut videtur *Heleniarum-Eriophyllinarum* novum. Capitula homogama discoidea minima ad apices ramorum solitaria; floribus omnibus hermaphroditis 4(–3). Involucrum anguste cylindricum; tegulis 4 uniseriatis aequalibus concavis achaenia semi-includentibus herbaceis. Receptaculum cum prosessu elongato centrali erecto quadrialato munitum. Corollae breves tubulosae regulares apice lobatae cylindricae flavae. Antherae vix cohaerentes apice longe appendiculatae, basi sagittatae auriculis brevibus triangularibus ecaudatis. Styli rami compressi apice obtusi exappendiculati. Achaenia subulata strigosa teretia multicostata. Pappi paleae 12–14 obovatae persistentes scariosae uniseriatae integrae basi cohaerentes inaequales.—Herbae annuae villosae. Folia opposita integerrima. (Name from ἐρημία, desert, and νᾶνος, dwarf.)

✓ **Eremonanus mohavensis**, sp. nov., minimus depressus 2–3 cm. diametro vix 1 cm. altus; cotyledonibus persistentibus oblongis ro-

tundatis late sessilibus anguste connatis; caulibus numerosis brevibus gracilibus prostratis glabris foliosis; foliis 6–8 mm. longis 1.0–1.7 mm. latis anguste oblanceolatis mucronatis firmis basi attenuatis supra glabratis vel sparse villosis subtus longe albo-villosis infimis rosulatis, caulinis oppositis; capitulis 4 mm. altis 1.3 mm. latis; pedunculis 1.0–2.5 mm. longis juventate villosis; tegulis 3.5 mm. longis oblanceolato-linearibus apice rotundatis vel obtusis breviter villoso-ciliatis; corollis 2.0–2.3 mm. longis faucibus brevissimis, tubo cylindrico externe pubescenti 1.5 mm. longo 0.6 mm. crasso, lobis acutis margine incrassatis; styli 1.6 mm. longi lobis 0.6 mm. longis usque ad apicem stigmaticis; antherarum loculis 0.5 mm. longis oblongis, appendicibus oblongis scariosis quam loculi ca. quartam partem brevioribus; filamentis obcompressis ca. 3 mm. sub antheris textura abrupte mutatis; achaeniis nigrescentibus 2.5 mm. longis 0.7 mm. latis; pappi paleis ad tegulas spectantibus longioribus.—CALIFORNIA: in collibus saxosis prope Barstow, May 1, 1922, *Mary F. Spencer 1949* (TYPE, Gray Herb.; ISOTYPE, Baker Herb.); May 1, 1922, *Fidella Woodcock* (Gray Herb. and Univ. Calif. Herb.).

The genus *Eremonanus* has its nearest relative in *Dimeresia Howellii* Gray, a monotype growing in eastern Oregon. It agrees with *Dimeresia* in being a depressed annual herb with persistent cotyledons, and in having opposite leaves, very narrow heads, and very few florets and tegules. It differs in having a pappus of 12–14 persistent obovate scales rather than one composed of numerous plumose bristles, solitary instead of glomerate heads, 4 instead of merely 2 tegules and florets, and finally short yellow corollas which are cut 1/3 their length instead of elongate flesh-colored corollas that are cut only about 1/6 their length. There is further a pronounced difference in the character of the receptacle. In *Dimeresia* it is very small, flat, and naked, whereas in *Eremonanus* the center of the receptacle is occupied by an elongated process about 1 mm. high which has 3–4 wing-like lobes that extend out between the achenes and join the adjacent tegules along their suture. The achene in *Eremonanus* is therefore attached in a pit formed partly by the process on the receptacle and partly by the base of the tegule.

Although *Eremonanus* and *Dimeresia* seem closely related, their position in the tribes of the *Compositae* is uncertain. In publishing *Dimeresia* Gray, Synop. Fl. N. A. ed. 2, ii. pt. 1. 448 (1886), placed the genus in the tribe *Inuleae*. This disposition was followed by Hoffmann in the Pflanzenfamilien, iv. Abt. 5, 193 (1890), who definitely placed the genus in the subtribe *Angianthineae* of the

Inuleae. Although the range and habit of *Dimeresia* are not in accord with the indubitable members of the *Angianthineae*, it seems to fit, as far as technical characters are concerned, into the subtribe as defined by Hoffmann, l. c., and by Bentham and Hooker, Gen. Pl. ii. 185 (1873). On the other hand *Eremonanus* is atypical in the crucial character of that subtribe, having solitary instead of glomerate heads. *Dimeresia* and *Eremonanus* appear so evidently related that it seems as though they must be associated in the scheme of genera. Their ranges make them very suspicious members of the *Inuleae-Angianthineae*, for otherwise, with the exclusion of an anomalous East Indian species, the members of the subtribe are entirely Australian and all have habits utterly different from *Dimeresia* and its relative. The two American genera do not occur in a region that has close floristic affinities with Australia, and it would seem more probable and less spectacular for the genera to have relations in some of the polymorphous West American groups. The most natural hypothesis would be that they are related to the helenioid genus *Eriophyllum*, for *Dimeresia* and *Eremonanus*, particularly the latter, strikingly simulate in habit certain species of that characteristic West American genus. Dissections seem to show that similarities go deeper than the surface. In fact *Eremonanus mohavensis* has similarly shaped fruit and pappus, and has florets which are quite similar to the outer disk-florets in *Eriophyllum multiflorum* (DC.) Gray and *E. Pringlei* Gray. In anthers particularly, these species of *Eriophyllum* are almost indistinguishable from *Eremonanus mohavensis*, all three species having sagittate anthers with broad triangular auricles. In fact upon consideration, it seems not improbable that *Eremonanus* is a relative of *Eriophyllum* in which specialization has been towards the reduction in number of parts. Considering structures, habit, and range there seems little doubt that *Eremonanus* finds its closest relations in the *Heleniae*. The same can be said of *Dimeresia*. The definitely sagittate anthers are the only inuloid developments in the two West American genera, but as that character is present in the habitally similar helenioid genus *Eriophyllum*, as well as in a number of other non-inuloid genera the character can be taken as substantiating the hypothecated helenioid relationship rather than necessitating a less clear one among the Australian inuloids. The genus *Eremonanus* and the seemingly related *Dimeresia* are hence placed with fair confidence in the *Heleniae-Eriophyllanae*, Rydb. No. Am. Fl. xxxiv. 81 (1915), in which they are characterized by their few tegules and florets, opposite leaves, and persistent cotyledons.

The discovery of *Eremonanus mohavensis* is the result of several days joint collecting by Mrs. Mary F. Spencer and Miss Fidella Woodcock, who spent the early days in May of last year in botanizing on the Mohave Desert near Barstow, San Bernardino County, California. Miss Woodcock writes me in detail that the plant was collected at "Ord's Mountain" "on the high bench near the east bank of the Mohave river nearly opposite the Santa Fe passenger station in Barstow." Going down a north slope "small patches of the plant appeared like mesa-moss," but at the base of the slope where water had settled "an abundance of it grew with *Glyptopleura* in fine gravel."

[Reprinted from RHODORA, Vol. 25, Nos. 296–297, August and September, 1923]

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MISSOURI BOTANICAL GARDEN
APR 9 1924

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A. BRACKETT.

I. REVISION OF THE AMERICAN SPECIES OF HYPOXIS.

THE genus *Hypoxis* occurs mostly in the southern hemisphere, extending into the northern hemisphere in subtropical Asia and by way of Mexico and the Antilles to the Atlantic slope of North America. All of our species have corms accompanied by somewhat fleshy root-fibers. They are herbs with grass-like, linear-lanceolate to nearly filiform and generally pilose leaves. The scapes are simple, one- to several-flowered. The peduncles are in general slightly pilose especially above, often glabrescent below. The pedicels are generally quite short; the bracts (when present) are setaceous and generally shorter than the pedicels. The ovary and capsule, commonly rather pilose when young, become nearly glabrous at maturity. The perianth-segments are narrowly elliptic, glabrous, yellow or white within, green and pilose without. The capsule is subglobose to subcylindric, generally three-lobed. The anthers of the American species are usually versatile but in one species, *H. sessilis* L., they are basi-fixed. The seeds are small, dark-colored, subglobose, muricate, bearing a beak and rostrate hilum.

In his *Synopsis of Hypoxidaceae*, Baker[1] recognized only three species of *Hypoxis* in all America, *H. juncea* Smith, *H. erecta* L. = *H. hirsuta* (L.) Coville and *H. decumbens* L. These were placed

[1] J. G. Baker, Journ. Linn. Soc. xvii. 93–126 (1878).

in his subgenus *Euhypoxis*, characterized by versatile anthers, while the species with basifixed anthers (and glabrous foliage) constituted his subgenus *Ianthe* of Australia and the Cape of Good Hope. *H. sessilis* of the Atlantic coastal plain is, therefore, of special interest since it has the pilose leaves and perianth of *Euhypoxis* but the basifixed anthers of *Ianthe*.

Baker's reduction of all the species in North and South America to three was natural because he was working with only the superficial characters. In attempting to place satisfactorily material of *H. sessilis* (the American species with basifixed anthers, not generally recognized since its publication by Linnaeus), it was found that the species of the United States are clearly separated by their seeds. The seed-characters proved so satisfactory, in this limited area, that the study was extended to cover the plants of the West Indies, Mexico, Central and South America. In carrying on this work I have examined the material in the Gray Herbarium and have been generously loaned the American specimens in the herbaria of the New York Botanical Garden, the Academy of Sciences of Philadelphia, the United States National Museum and the Missouri Botanical Garden. I wish here to express my thanks for the use of this material to those in charge of the different collections: Professors Robinson and Britton and Doctors Pennell, Maxon and Greenman. Throughout the work I have had the constant suggestions and aid of Professor Fernald and much aid in the bibliography from Miss Day and Miss Vincent of the Gray Herbarium library.

I have made critical studies of all the fruiting material available. The seed-characters of the plants from south of the United States prove as satisfactory as was hoped and, supported by other characters, indicate that there are at least fifteen, instead of only three American species. The regions in America where *Hypoxis* seems to have the greatest variety of species are the southeastern and Gulf coastal plain of the United States (from South Carolina to Texas), the upland of Mexico and the northern Andes. It is probable that South America will furnish more species than are here treated: the material seen from that region has been very scanty and at least two of the South American species described by Humboldt, Bonpland and Kunth have not been satisfactorily matched, and new species are likely to be discovered.

The results of this study are embodied in the following key to and synopsis of the American species. In the drawings I have shown the habit ($\times$ ½) and the seed (approximately $\times$ 40) of each species.

Key to Species

A. Mature seeds black B.
  B. Leaves linear-filiform, canaliculate or involute, less than 1 mm. broad; seeds with truncated, irregularly carved murications ..... *1. H. juncea.*
  B. Leaves linear to lanceolate, broader; seeds muricate, papillose or with rounded pebbling C.
    C. Sheaths not usually disintegrating into bristles at the base D.
      D. Seeds covered with numerous, closely crowded, spine-like murications, lustrous E.
        E. Leaves 1–8 mm. broad, stiff and loosely ascending; peduncles stiffish, usually 2–7-flowered; mature ovary loosely and densely villous; seeds with murications sharp-pointed ..... *2. H. hirsuta.*
        E. Leaves 3.5–12 mm. broad, very thin and flaccid; peduncles capillary and lax, 1–3(rarely 4)-flowered; mature capsule slightly pubescent to glabrate; seeds with bluntish murications coarser than in typical *H. hirsuta* ..... *2a. H. hirsuta*, var. *leptocarpa.*
      D. Seeds covered with often nearly confluent, low, rounded pebbling, generally not lustrous; leaves flaccid F.
        F. Scapes 1–4-flowered ..... *3. H. decumbens.*
        F. Scapes generally 4–8-flowered; larger form, usually more pilose ..... *3a. H. decumbens*, var. *major.*
    C. Sheaths disintegrating into fibers G.
      G. Leaves rather stiff and pilose; fibers forming generally rather dense tufts; scapes 1–2-flowered; the pedicels shorter than the flowers; seeds covered with low, rounded, closely approximate pebbling ..... *4. H. rigida.*
      G. Leaves flaccid, becoming only slightly fibrillous; scapes 2–4-flowered; the pedicels much exceeding the flowers; seeds papillose, bearing irregularly elongate, obtuse papillae ..... *5. H. tepicensis.*
A. Mature seeds brown or drab (black only underlying the outer coat and about the beak and rostrate hilum), sometimes showing iridescence H.
  H. Seeds iridescent I.
    I. Anthers nearly basifixed; the basal lobes short and rounded; leaves linear-lanceolate, not distinctly narrowed at the base; flowers solitary, often nearly sessile; seeds with gold or blue colors predominating. *6. H. sessilis.*
    I. Anthers versatile; the basal lobes longer, tapering at the ends; leaves linear-lanceolate, narrowed almost to petioles near the base; scapes 1–2-flowered; seeds black beneath the exfoliating outer coat which clings as remnants about the flat pebbling and shows flecks of iridescence ..... *7. H. breviscapa.*
  H. Seeds not iridescent or rarely with slight iridescent fleckings J.
    J. Seeds rarely showing any black except at beak or hilum K.

K. Seeds minutely muricate, beak nearly obsolete; basal sheaths membranous, often thick and dark, rarely becoming fibrillous; scapes 1–few-flowered . . *8. H. micrantha.*

K. Seeds more coarsely muricate; beak well developed L.

L. Beak and hilum set in a lustrous, black, wedge-shaped spot; murications stiff, conical and sharp-pointed; basal sheaths becoming quite fibrous. *9. H. potosina.*

L. Beak and hilum not set in a lustrous, wedge-shaped spot M.

M. Seeds covered with low, blunt, corrugated pebbling; basal sheaths membranaceous, generally becoming fibrillous . . . . . *10. H. Wrightii.*

M. Seeds covered with spine-like or subulate processes N.

N. Outer coat of loose texture, wrinkled and pinched into scarcely confluent, little peaks, persistent; basal sheaths becoming fibrous. *11. H. rugosperma.*

N. Outer coat of firmer texture, covered with sharp or obtuse spine-like processes O.

O. Basal sheaths disintegrating into dense fibers; seeds with firm conical, obtuse, scarcely confluent processes . . . . . *12. H. fibrata.*

O. Basal sheaths becoming somewhat fibrillous; seeds darker, with firm, sharp-pointed, rather crowded processes, the sides of which seem to be grooved or lined . . . . . *13. H. humilis.*

J. Seeds generally showing much of the black under coat P.

P. Murications rather sharp, fine and closely crowded, the outer seed-coat exfoliating irregularly, especially the brown tips of the murications adhering to the low, flat markings of the inner coat; sheaths rarely becoming fibrillous . . . . . *14. H. mexicana.*

P. Murications very low and broad, the remnants of the outer coat adhering irregularly, especially around the bases of the low, black processes; seeds mostly black; sheaths scarcely fibrillous . . . . . *15. H. catamarcensis.*

1. H. JUNCEA Smith. Corm elongate, 5–12 mm. thick, covered with membranous or slightly fibrillous, brown sheaths: leaves filiform, canaliculate or involute, 0.4–0.8 mm. broad, up to 3.5 dm. long: peduncles filiform, loosely pilose or glabrate, 0.5–2 dm. long, 1–2-flowered: ovary and capsule densely pilose: perianth with lanceolate to narrowly elliptic, acutish segments, 0.8–1.5 cm. long: capsule ellipsoid, 4–6 mm. long: seeds about 1 mm. in diameter, black, lustrous, the outer coat covered with flattened or truncated pebbling.—Spicil. ii. 15, t. 16 (1792): Willd. Spec. ii. 110 (1799): Aiton fil. Hort. Kew. ed. 2: ii. 255, (1811): Pursh, Fl. Sept. Amer. i. 224 (1814): Roem. & Schultes, Syst. Veg. vii. 761 (1830). *H. filifolia* Elliott, Sketch, 397 (1817).—Pine barrens of Florida, locally north to South Carolina.

Elliott in his *Botany of South Carolina* said he had not seen any species of *Hypoxis* that was strictly one-flowered although he accorded

H. juncea recognition as a species on "the high authority of Sir J. E. Smith." He also called the few-flowered but otherwise similarly described plant *H. filifolia.* I have examined seeds of both the one- and the few-flowered specimens and I have found practically no differences between them. The original description and plate are characteristic although Smith stated that his plant was "Discovered

FIG. 1. H. juncea and seed.

in boggy ground in Carolina by the indefatigable Mr. John Fraser, from whose garden this specimen was obtained." *H. juncea* is very common in Florida and, judging by herbarium representation, rare in Georgia and extremely local in South Carolina (seen only from Charleston). Prior to the publication of *H. juncea,* Fraser had collected extensively in South Carolina and in Georgia and since Elliott's *H. filifolia* also came from South Carolina and Georgia it may be that *H. juncea* has a broader range than herbarium-material

indicates. It is possible, however, that Elliott, who lived at Charleston, knew the plant at the northern limit of its range. *H. juncea* has been credited to Alabama but upon the only reputed Alabama specimen in the National Herbarium, Mohr made the memorandum: "Locality doubtful, of later years not found in Alabama." The species is not admitted in Mohr's *Plant Life of Alabama.*

The following are referred here. SOUTH CAROLINA: *M. A. Curtis,* fragmentary specimen (hb. Mo. Bot. Gard.); near Charleston, *Beyrich* (hb. Mo. Bot. Gard.). GEORGIA: one plant, ex. herb. George Thurber (hb. Gray); three plants, *Le Conte* (hb. Phil. Acad.); plant collected by *Dr. Harden* in 1884 (hb. Phil. Acad. no. 567726) of doubtful authenticity since the specimen is of separate, filiform, canaliculate leaves stuck loosely around an *Hypoxis* scape which is badly preserved; Chatham County, Savannah, *C. S. Williamson* (hb. Phil. Acad.); Wayne County, Jessup, low pine barrens, *A. Ruth,* 1893 (hb. Mo. Bot. Gard.); Berrian County, *Le Conte* (hb. Phil. Acad.); Camden County, St. Mary's, *D. B. Smith* (hb. Phil. Acad.); Lowndes County, rather dry pine barrens south of Melrose, geological formation, Oligocene overlaid by Lafayette and Columbia, altitude 48.8 meters (160 feet), *Roland M. Harper,* no. 1604 (hb. U. S. Nat. Mus., hb. Mo. Bot. Gard., hb. Gray, hb. N. Y. Bot. Gard.). FLORIDA: Since the bulk of the herbarium material of this species comes from Florida only specimens having seeds or their duplicates are cited from this state. Duval County, pine barrens near Jacksonville, *A. H. Curtiss,* no 2838 (hb. Gray, hb. Phil. Acad., hb. Mo. Bot. Gard., hb. U. S. Nat. Mus.); Franklin County, low pine barrens, Apalachicola, no. 2527[a], "distribution of duplicates of the Chapman herb" (hb. U. S. Nat. Mus., hb. Gray); Lake County, collected in the vicinity of Eustis, low pine land, *Geo. V. Nash,* no. 952 (hb. U. S. Nat. Mus., hb. Mo. Bot. Gard., hb. N. Y. Bot. Gard., hb. Gray); in vicinity of Eustis, *Geo. V. Nash,* no. 789 (hb. Phil. Acad., hb. U. S. Nat. Mus.) and no. 2072 (hb. U. S. Nat. Mus.); Brevard County, Indian River, *Edward Palmer,* no. 557 (hb. U. S. Nat. Mus., hb. Gray); Polk County, wet soils, *L. B. Ohlinger,* no. 599 (hb. Mo. Bot. Gard.); Pinellas County, Dunedin, *S. M. Tracy,* no. 6866 (hb. U. S. Nat. Mus., hb. Mo. Bot. Gard., hb. N. Y. Bot. Gard.); Manatee County, in pine forests, Osprey, *Benjamin H. Smith,* (hb. Phil. Acad.); Bradentown, *S. M. Tracy,* no. 7514 (hb. Mo. Bot. Gard.); Lee County, vicinity of Fort Myers, in pineland, *Miss Jeanette P. Standley,* no. 7 (hb. U. S. Nat. Mus., hb. Gray, hb. Mo. Bot. Gard., hb. N. Y. Bot. Gard.) and in pine woods, *Paul C. Standley,* no. 12963 (hb. U. S. Nat. Mus.). Locality unknown, *Chapman,* two sheets with seeds, one in the Gray Herbarium and the other in the herbarium of the Mo. Bot. Gard. ALABAMA: hb. Charles Mohr "locality doubtful, of later years not found in Ala., not admitted in catalogue," *Buckley* (hb. U. S. Nat. Mus.).

This material was mostly distributed as *H. juncea* or as *H. filifolia*.

2. H. HIRSUTA (L.) Coville. Corm subglobose to ellipsoid, 0.5–2? cm. thick, covered with membranaceous, pale or brown-tinged sheaths not becoming fibrillous: leaves linear, rather firm, 1–8 mm. broad, 1–6 dm. long; peduncles filiform, stiffish or spreading, 0.4–3.5 dm. long, mostly 2–7-flowered; the pedicels elongate; ovary and capsule densely pilose; perianth-segments lanceolate to elliptic or narrowly ovate, 0.5–1.5 cm. long; capsule ellipsoid, 2–6 mm. long; seeds 0.8–1.3 mm. in diameter, black, lustrous; the outer coat closely covered with sharp murications.—Mem. Torr. Bot. Cl. v. 118 (1894). *Ornithogalum hirsutum* L. Sp. 306 (1753). *H. erectum* L. Syst. ed. 10, ii. 986 (1759). *H. pallida* Salisb. Prodr. 248 (1796). *H. carolinensis* Michx. Fl. Bor.-Am. i. 188 (1803). *H. graminea* Pursh, Fl. Am. Sept. i. 224 (1814). *H. grandis* Pollard in Small, Fl. S. E. U. S. 287 and 1329 (1903).—Open woods, meadows, and pastures, southern New Hampshire to Manitoba, south to Florida and Texas, ascending in the southeastern states to an altitude of 1220 meters (4000 feet).

FIG. 2. H. hirsuta and seed.

Extremely variable in breadth of leaf and size and shape of perianth-segments but throughout its range not readily separated into definite

varieties. The broad-leaved plant distinguished as *H. grandis* Pollard from the southern states is often found north to New York and New England while the narrowest-leaved phase, *H. carolinensis* Michx., occurs westward to Manitoba, Minnesota, Iowa and Oklahoma. The seed ordinarily has very sharp murications but often the northern plant has the murications broader and less acute than usual thus closely connecting the typical plant with the variety. Since *H. hirsuta* is so very common and the various herbaria contain hundreds of sheets, only a few specimens, with seeds unless otherwise stated, and their duplicates at the limits of the ranges, as shown by the herbarium material, are cited here.

NEW HAMPSHIRE: Pelham, Hillsboro County, *Clarence H. Knowlton* (hb. Gray). MASSACHUSETTS: swamp, Falmouth, Barnstable County, *Clarence H. Knowlton* (hb. Phil. Acad., hb. Gray). CONNECTICUT: Bridgeport, *E. H. Eames*, no. 1 (hb. Gray). NEW YORK: Long Island, *H. von Schrenk* (hb. Mo. Bot. Gard.). NEW JERSEY: between Tuckerton and Atsion, *C. F. Saunders & W. N. Clute* (hb. Phil. Acad.). DELAWARE: dry soil, Greenbank, *A. Commons* (hb. Mo. Bot. Gard.). MARYLAND: Baltimore County, *John Donnell Smith* (hb. U. S. Nat. Mus.). VIRGINIA: Bay Bank, Hampton, *D. Harrison* (hb. U. S. Nat. Mus.). SOUTH CAROLINA: Newry, Oconee County, *H. D. House* (hb. Mo. Bot. Gard.). GEORGIA: Stone Mountain, *H. Eggert* (hb. Mo. Bot. Gard.). ALABAMA: *Charles L. Pollard & William R. Maxon*, no. 72 (hb. U. S. Nat. Mus.). MISSISSIPPI: dry soil, Meridian, Lauderdale County, *Biltmore Herb.*, no. 529^c (hb. U. S. Nat. Mus.). TEXAS: Dallas, damp sands, *Reverchon*, no. 2760 (hb. Mo. Bot. Gard.). OKLAHOMA: Page, *O. W. Blakley*, no. 1408 (hb. Mo. Bot. Gard., hb. Gray. hb. U. S. Nat. Mus.) and no. 3433. (hb. Mo. Bot. Gard., hb. Gray). COLORADO: Denver, *Schneck*, without seeds (hb. Mo. Bot. Gard.). NEBRASKA: meadow, Platte Islands, Kearney, *Ernest R. Holmes* (hb. N. Y. Bot. Gard.). SOUTH DAKOTA Brookings, *Thos. A. Williams* (hb. Mo. Bot. Gard.). NORTH DAKOTA: Butte, Benson County, *Dr. J. Lunell* (hb. N. Y. Bot. Gard.). ASSINIBOIA: near Moose Mt. Creek, meadows and open woods, *Jas. M. Macoun* (hb. Gray). MANITOBA: Stony Mt., *John Macoun*, no. 13799 (hb. Gray).

2a. Var. **leptocarpa** (Engelmann & Gray), n. comb. Leaves very thin and flaccid, often quite glabrous, 3.5–12 mm. broad, 2–8 dm. long; peduncles very slender and lax, mostly 1–3(rarely 4)-flowered; perianth-segments 5–8 mm. long; mature capsules 4–10 mm. long. slightly pubescent to glabrate; seeds black, with bluntish murications. —*H. erecta*, var. *leptocarpa* Engelmann & Gray, Bost. Journ. Nat. Hist. v. 239 (1845). *H. leptocarpa* Engelmann in Engelmann & Gray, l. c. (1845). *H. Curtissii* Rose in Small Fl. S. E. U. S. 287 and

1329 (1903). *H. decumbens* Chapman, Fl. ed. 2, supplement 2: 696 (1892), not L.—Wet woods, swamps and bottom-lands, North

Fig. 3. H. hirsuta, var. leptocarpa.

Carolina to Florida and Texas. The following specimens are referred here. North Carolina: in damp clay soil, Goldsboro, Wayne County, *Biltmore Herb.*, no. 529[d], with seeds (hb. U. S. Nat. Mus.).

GEORGIA: rich damp woods, Dublin, Laurens County, *R. M. Harper*, no. 1365 (hb. Gray, hb. U. S. Nat. Mus., hb. Mo. Bot. Gard.). FLORIDA: Apalachicola, with seeds, *Chapman* (hb. N. Y. Bot. Gard.); shore of St. John's River at Tocoi, growing in water, *A. H. Curtiss*, no. 2837*, with seeds (hb. U. S. Nat. Mus., hb. Mo. Bot. Gard.) distributed as *H. leptocarpa* Engelmann; swamps near Jacksonville, *A. H. Curtiss*, no. 4727, with seeds (hb. U. S. Nat. Mus., hb. N. Y. Bot. Gard.); river banks, Apalachicola, *Chapman*, no. 4015, with seeds (hb. U. S. Nat. Mus.), distributed as *H. decumbens* L.; Palmetto, *S. M. Tracy*, no. 6621 (hb. U. S. Nat. Mus., hb. Mo. Bot. Gard., hb. Gray). LOUISIANA: Lake Charles, Calcasien Parish, *E. J. Palmer*, no. 8519 (hb. Mo. Bot. Gard.). TEXAS: sandy soil, near water courses, *F. Lindheimer*, no. 188 (hb. Gray).

3. H. DECUMBENS L. Corm cylindric to ellipsoid, 0.7–2 cm. thick; the membranaceous sheaths not fibrillous: leaves flaccid, often falcate, linear to lanceolate, 2–12 mm. broad, 1–4 dm. long, sparsely pilose to glabrate; peduncles filiform, loosely ascending or recurving, 0.2–2 dm. long, villous above, 1–4-flowered; perianth-segments lanceolate, acute, 4–10 mm. long; mature pedicels 1–20 mm. long, mostly equalled by the bracts; capsule club-shaped, cylindric or slenderly ellipsoid, usually densely pilose, 0.6–1.7 cm. long; seeds 0.8–1.2 mm. in diameter, black, dull or but slightly lustrous, covered with low, rounded scarcely confluent pebbling.—Pl. Jam. Pugill. 11 (1759) & Syst. ed. 10, 986 (1759). *H. caricifolia* Salisb. Prodr. 248 (1796). *H. gracilis* Lehm. ex Schultes f. Syst. vii. 764 (1830). *H. decumbens*, var. *mexicana* (Schultes f.) Jennings, Ann. Carnegie Mus. xi. 97 (1917).—In open woods and pastures in the Antilles, tropical Mexico and South America. Since the herbarium material is so abundant for this species only one or two typical plants having seeds, and their duplicates, from each locality are cited here. CUBA: near Monte Verde, *C. Wright*, no. 1515 (hb. Gray, hb. Mo. Bot. Gard., hb. N. Y. Bot. Gard.). JAMAICA: Cinchona, *Willard N. Clute*, no. 208 (hb. U. S. Nat. Mus., hb. Mo. Bot. Gard., hb. Phil. Acad., hb. Gray.). HAITI: on banks, Petit Borgne to Mt. Casse, *George V. Nash*, no. 488 (hb. N. Y. Bot. Gard.); on banks, Mt. Maleuvre to Mt. Piment, *Geo. V. Nash & Norman Taylor* no. 1183 (hb. N. Y. Bot. Gard.). SAN DOMINGO: Prov. of Vega, *Miguel Fuertes*, no. 1704 (hb. N. Y. Bot. Gard.). PORTO RICO: in pineapple plantations near Mayaguez, *Holm*, no. 67 (hb. Mo. Bot. Gard., hb. Gray). TORTOLA: hillside, 325 m. alt., *N. L. Britton & J. A. Shafer*, no. 779 (hb. N. Y. Bot. Gard., hb. U. S. Nat. Mus.). ANTIGUA: *J. N. Rose, Wm. R. Fitch & Paul G. Russell*, no. 3346 (hb. U. S. Nat. Mus., hb. N. Y. Bot. Gard.). DOMINICA: *Francis E. Lloyd*, no. 579 (hb. N. Y. Bot. Gard.). MARTINIQUE: *Père Duss*, no. 2011 (hb. U. S. Nat. Mus., hb. N. Y. Bot. Gard.). ST. VINCENTS: *H. H. Smith, G. W. Smith, & Comn. F. D. Godman*, no. 14 (hb. N. Y. Bot. Gard.). TOBAGO: Mason Hall near the river, *W. E. Broadway*

Fig. 4. H. decumbens and seeds (showing variation).

no. 4724 (hb. Gray, hb. U. S. Nat. Mus., hb. Mo. Bot. Gard., hb. N. Y. Bot. Gard.). Mexico: Alvarez, state of San Luis Potosi, *Dr. Edward Palmer*. no. 232 (hb. Mo. Bot. Gard., hb. U. S. Nat.

Mus., hb. N. Y. Bot. Gard.). COSTA RICA: *Tonduz*, no. 8028 (hb. U. S. Nat. Mus.). PANAMA: moist field at foot of Piedro de Lino,

FIG. 5. H. decumbens, var. major.

E. P. Killip, no. 3570 (hb. U. S. Nat. Mus.). COLOMBIA: forests of Popayan, *Lehmann*, no. 7599 (hb. N. Y. Bot. Gard.). FRENCH GUIANA: vicinity of Cayenne, *W. E. Broadway*, no. 220 (hb. Gray, hb. N. Y. Bot. Gard.). EQUADOR: in the Andes, *R. Spruce*, no.

5068 (hb. Gray). Brazil: near Rio de Janeiro, from the herbarium of the U. S. South Pacific Exploring Expedition under the command of Capt. Wilkes, U. S. N. 1838–42 (hb. Gray). Galapagos Islands: common in open woodlands at 183 m. (600 ft.), Albemarle, *Alban Stewart*, no. 1135 (hb. Mo. Bot. Gard., hb. U. S. Nat. Mus., hb. Gray). Paraguay: *Dr. E. Hassler*, no. 5562 (hb. Gray).

This material was mostly distributed as *H. decumbens*.

3a. Var. major Seubert. Plants coarser than the above; seeds similar.—Seubert in Mart. Fl. Brasil. iii. pt. i. 51, t. 7, f. 1(1847). *H. racemosa* Donnell Smith, Bot. Gaz. xiv. 30 (1889).—Locally throughout the range of the above. The following are referred here. Mexico: Orizaba, *Botteri*, no. 80 (hb. Gray), no. 455 (hb. Gray), 463 (hb. Gray); Mt. Orizaba, *Henry E. Seaton* (hb. Gray). San Luis Potosi: Alvarez, *Dr. Edward Palmer*, no. 581 (hb. U. S. Nat. Mus.). Vera Cruz: near Jalapa, *J. N. Rose & Walter Hough*, no. 4326 (hb. U. S. Nat. Mus.). Jamaica: Tyre, near Troy, *Wm. Harris*, no. 9401 (hb. U. S. Nat. Mus.). Guatemala: Dept. Alta Verapaz, *H. von Tuerckheim*, no. 3842 (hb. U. S. Nat. Mus.); Coban, Dept. Alta Verapaz, *Tuerckheim*, no. 33 (hb. Gray). Colombia: Santa Marta, *Herbert H. Smith*, no. 2266 (hb. Gray). Venezuela: *A. Fendler*, no. 1565 (hb. Gray, hb. N. Y. Bot. Gard.). Trinidad: from herb. of Otto Kuntze, no. 959 (hb. N. Y. Bot. Gard.); Lookout Hill, *W. E. Broadway* (hb. Mo. Bot. Gard.). Brazil: near Rio de Janeiro, hb. of the U. S. South Pacific Exploring Expedition under the command of Capt. Wilkes, U. S. N. (hb. U. S. Nat. Mus.). Paraguay: *Fiebrig*, no. 891 (hb. Gray).

This material was distributed simply under the generic name or, if further determined, as *H. decumbens* or as *Curculigo scorzoneraefolia* (Lam.) Baker.

4. H. rigida Chapman. Corm subcylindric to ellipsoid, 0.6–1.5 cm. thick, covered with the stiff bristly bases of the old sheaths or rarely with membranous, slightly disintegrating leaf bases: leaves rather rigid, linear, 1–4 mm. broad, 0.7–4 dm. long; peduncles glabrate, 0.3–3 dm. long, 1–3-flowered; ovary and capsule pilose; perianth-segments 7–12 mm. long, lanceolate to oblong, acutish, densely pubescent without; capsule narrowly obovoid, 1–9 mm. long; seeds 1 mm. in diameter, black, opaque or slightly lustrous, covered with short, rounded, approximate pebbling.—Fl. So. U. S. ed. 2. Suppl. 2: 696 (1892).—Low pine barrens, North Carolina to Florida and Texas. The following are referred here. Locality unknown: one plant with seeds (hb. Gray); *Chapman*, no. 4573, without seeds (hb. Mo. Bot. Gard.). Florida: *F. Rugel*, 1842–1849, ex herb. Mus. Brit., without seeds (hb. Mo. Bot. Gard.); Apalachicola, *Chapman*, with seeds (hb. U. S. Nat. Mus.), *Chapman*, ex herb. Chas. Mohr (hb. U. S. Nat. Mus.). Alabama: Mobile, *Chas. Mohr*,

without seeds (hb. U. S. Nat. Mus.). MISSISSIPPI: Biloxi, *S. M. Tracy*, no. 5090 (sheets with and without seeds at hb. U. S. Nat. Mus., also one sheet without seeds at hb. Mo. Bot. Gard.), no. 5091, without seeds (hb. U. S. Nat. Mus.), no. 5092, with seeds (hb. U. S.

FIG. 6. H. rigida and seed.

Nat. Mus.), no. 5093, without seeds (hb. U. S. Nat. Mus.), Ocean Springs, without seeds (hb. Mo. Bot. Gard.). LOUISIANA: open sandy ground, Natchitoches Parish, *E. J. Palmer*, no. 1566, with seeds (hb. Mo. Bot. Gard.); Alexandria, *Josiah Hale*, with seeds (hb. U. S. Nat. Mus.). TEXAS: thirty miles northeast of Beaumont, *W. L. Bray*, no. 68, without seeds (hb. U. S. Nat. Mus.); Swan, swamps,

"flowers shut after noon," *J. Reverchon*, no. 2759, with seeds (hb. Mo. Bot. Gard., hb. U. S. Nat. Mus.); Pine Island, Angelina, *J. Reverchon*, no. 2780, without seeds (hb. Mo. Bot. Gard.).

As shown by the herbarium sheets this plant has sometimes been distributed as *H. juncea* Smith. Although rarely it tends to approach *H. juncea* in habit, generally it has a dense tuft of coarse fibers at the base and wider leaves. It has also been distributed as *H. decumbens* L., but superficially it differs from *H. decumbens* in having a stiff tuft of bristles at the base, while the leaves of *H. decumbens* do not disintegrate into fibers. Most often it has been distributed as *H. hirsuta* (L.) Coville. The bristly base and the coarser texture of the leaves should superficially distinguish it from *H. hirsuta*. The seeds clearly separate it from each of the above mentioned species.

5. **H. tepicensis**, n. sp., cormo ellipsoideo 9 mm. crasso vaginis scariosis fibrillosis pallide brunneis investo; foliis linearibus subrigidis 3–6 mm. latis 0.6–4 dm. longis sparse pilosis; pedunculis sparse pilosis vel glabratis 0.4–3 dm. longis; pedicellis arcuatis 2–5 cm. longis; ovario capsulaque pilosis; segmentis perianthii lanceolatis subacutis 7–10 mm. longis extus viridibus; capsulis ellipsoideis 4–8 mm. longis; seminibus 0.7–1.3 mm. diametro atris densissime papillosis, papillis valde elongatis obtusis.

Corm ellipsoidal, 9 mm. thick, covered with scarious, fibrillous, light brown sheaths; leaves linear, rather rigid, 3–6 mm. broad, 0.6–4 dm. long, sparsely pilose; peduncles sparsely pilose or becoming glabrate, 0.4–3 dm. long; pedicels curving, 2–5 cm. long; ovary and capsule pilose: perianth-segments lanceolate, rather acute, 7-10 mm. long, green outside: capsule ellipsoidal, 4–8 mm. long; seeds 0.7–1.3 mm. in diameter, black, very densely papillose; the papillae strongly elongated and obtuse.—In western Mexico. The following are referred here. Tepic: Pedro Paulo, *J. N. Rose*, no. 3319, as the type of this species, with seeds (hb. U. S. Nat. Mus.); between Pedro Paulo and San Blascito, *J. N. Rose*, no. 3307, with seeds (hb. U. S. Nat. Mus.).

6. H. sessilis L. Corm cylindric to slenderly ovoid, 0.5–1 cm. thick, covered with membranous but scarcely fibrillous brown sheaths; leaves linear, 1–4 mm. broad, 0.7–3 dm. long, firm; peduncles essentially wanting or up to 8 cm. long, filiform, pilose; ovary and capsule densely pilose; perianth-segments lanceolate, rather acute, 7–12 mm. long; capsule pyriform, 3–4 mm. long; seeds black, ellipsoid, 1–4 mm. in diameter; the low, flat pebbling almost completely covered with a closely granular film or coating of a golden-brown iridescent material; the short beak and rostrate hilum black.—Sp. Pl. ed. 2. 439 (1762). *H. erecta*, β *aestivalis* Engelm. & Gray, Bost. Journ.

Nat. Hist. v. 239 (1845).—Dry pine barrens and sandy openings, in the southern United States.

FIG. 7. H. tepicensis and seed.

Linnaeus based *H. sessilis* solely upon *Ornithogali Virginici facie, Herba tuberosa carolinensis* of Dillenius, Hort. Elth. ii. 298 t. 220 f. 287. This plant was described as coming from Carolina and having sessile flowers. Although the description and the conventional plate

are not conclusive the plant here treated as *H. sessilis* was presumably intended. The Carolina plant, as shown by herbarium material, does not have the flower strictly sessile, nor are the leaves as large as in Dillenius's plate; but the latter besides being crude was made from a cultivated plant. In view of this plant from "Carolina" it would be unwise to set up as a distinct species the plant we actually know from that region.

Fig. 8. H. sessilis and seed.

Some excellent specimens in the herbarium of the Missouri Botanical Garden were sent to Bernhardi labeled in Engelmann's hand *H. erecta* β *aestivalis*; other material originally retained by Engelmann (with Lindheimer's field label) is unmarked, but is identical with the material sent Bernhardi and the fragmentary plants in the Gray Herbarium, originally marked by Dr. Gray as var. *aestivalis*. These specimens are without seeds but they seem identical with the material from the southeastern United States that is called *H. sessilis*.

The following are referred to this species. LOCALITY UNKNOWN: *Chapman*, no. 3856, with seeds (hb. Mo. Bot. Gard.). NORTH CAROLINA: Wilmington, *C. S. Williamson*, without seeds (hb. Phil. Acad.). SOUTH CAROLINA: sandy loam in open places, Summerville, *B. L. Robinson*, no. 176, without seeds (hb. Gray). FLORIDA: *F. Rugel*, 1842–1849, ex herb. Mus. Brit. no. 132, without seeds (hb. Mo. Bot. Gard.). ALABAMA: ex herb. George Thurber, with seeds (hb. Gray); *Gates*, with seeds (hb. Phil. Acad.); *Buckley*, with seeds (hb. N. Y. Bot. Gard.). TEXAS: *Lindheimer*, no. 187, without seeds (hb. Gray, hb. Mo. Bot. Gard.). Also two specimens from South Carolina. One was sent in a letter by M. A. Curtis, from Society Hill, Sept. 15, 1853, to Dr. Gray with the following remarks, "I send also an abortive Hypoxis now not uncommon here as a second growth of the season. Flower three cleft, white." The seeds of this plant have very little of the golden iridescent coloring but show a marked preponderance of a brilliant blue color. The other was sent by Miss Laura M. Bragg to Professor Fernald from Dackon, Berkeley Co., with the following field label, "In second growth . . . pine-land. Broom grass association. Coll. . . . June 21, 1920." Both of the above specimens have longer leaves than the usual *H. sessilis* and the flowers are only three-cleft.

7. H. BREVISCAPA HBK. Corm subglobose 5–7 mm. thick, covered with dark brown, membranous sheaths disintegrating into tufts of fibers; leaves lanceolate, decidedly narrowed at the base, about 2 mm. broad, up to 1.2 dm. long, pilose; peduncles filiform, about 3.5 cm. long, 1–2-flowered; ovary and capsule pilose; perianth-segments narrowly elliptic, 3–4.5 mm. long; capsule subcylindric, 5–7 mm. long; seeds about 0.8–1.1 mm. in diameter, black, covered with a brown exfoliating outer coat that is flecked with iridescent material.—Gen. et Sp. Pl. i. 286 (1815).—Plateaus in South America.

H. breviscapa was reported by Humboldt, Bonpland and Kunth as coming from Brazil. The one sheet of herbarium material answering the description of this species, no. 1042, with seeds, *Miguel Bang* (hb. N. Y. Bot. Gard.), came from Bolivia. It shows the leaves narrow at the base as the Brazilian plant is described, and all but one of the plants have a single flower to each peduncle.

8. H. MICRANTHA Pollard. Corm subglobose to subcylindric, 4–12 mm. thick, covered with the dark membranaceous bases of the old leaves rarely disintegrating into bristly fibers; leaves linear-lanceolate, 1–6 mm. broad, 0.8–4 dm. long, pilose; peduncles pilose, 5–18 cm. long; ovary and capsule pilose; perianth-segments 3.5–15 mm. long, rather acute at the apex; capsule subglobose to subcylindric, 4–9 mm. long; seeds brown, covered with very numerous, minute, awl-shaped murications.—Pollard in Small, Fl. S. E. U. S. 287 and 1329 (1903).—Southern United States and adjacent islands. The fol-

lowing are referred here. North Carolina: *G. McCarthy*, "type specimen," without seeds (hb. U. S. Nat. Mus.); *G. McCarthy*, without seeds (hb. U. S. Nat. Mus.); Wilmington, *Edwin B. Bartram*, without seeds (hb. N. Y. Bot. Gard.). South Carolina: pine barrens two miles north of Manning, Clarendon County, *Witmer Stone*, no. 72, with seeds (hb. Phil. Acad.); near Kittredge railroad station, Berkeley County, with seeds (loaned by Miss Bragg). Florida: Apalachicola, with seeds (hb. Mo. Bot. Gard. no. 107259); Apalachicola, *Chapman*, with seeds (hb. N. Y. Bot. Gard.); Aspalaga,

Fig. 9. H. breviscapa and seed.

Chapman, with seeds (hb. Mo. Bot. Gard. nos. 760670 and 760671). Mississippi: *S. M. Tracy*, no. 5095, with seeds (hb. N. Y. Bot. Gard.); Biloxi, *S. M. Tracy*, no. 6418 (with seeds, hb. Mo. Bot. Gard. nos. 107313 and 107314, without seeds, hb. U. S. Nat. Mus., with seeds, hb. N. Y. Bot. Gard.). Most specimens from the above states, without seeds, I have omitted from this list. Louisiana: Natchitoches, *E. J. Palmer*, no. 7380, without seeds (hb. Mo. Bot. Gard.). Texas: Marshall, Harrison County, *E. L. Palmer*, no. 5316, without seeds (hb. Mo. Bot. Gard.); *Elihu Hall*, no. 632, without seeds (hb. U. S. Nat. Mus., hb. Gray, hb. N. Y. Bot. Gard.). Isle of Pines:

vicinity of San Pedro, pinelands, *N. L. Britton, Percy Wilson & A. D. Selby*, no. 14332, with seeds (hb. N. Y. Bot. Gard.).

This material was distributed mostly without a specific name, as *H. juncea* Smith, or in a few instances as *H. micrantha.*

FIG. 10. H. micrantha (left) and seed (below).
H. potosina (right) and seed (above).

9. **H. potosina,** n. sp., cormo globoso vel subcylindrato 0.8–1.3 cm. crasso vaginis membranaceis et saepe fibrillatis brunneis investo; foliis lineari-lanceolatis crassis dense pilosis (juventute subtus villosis) 1.2–4.8 mm. latis usque ad 3.5 dm. longis; pedunculis subfiliformibus canaliculatis pilosis 0.7–1.2 dm. longis uni- vel pauci-floris; ovario

capsulaque dense pilosis; segmentis perianthii pilosis ellipticis 5–13 mm. longis; seminibus 0.8–0.9 mm. diametro brunneis, testa aculeis elongatis munita, funiculo foramineque atris a naevo lucido atro spathulato circumscriptis.

Corm globose to subcylindric, 0.8–1.3 cm. thick, covered with membranous and often fibrillous brown sheaths; leaves linear-lanceolate, coarse in texture and rather densely pilose (when young villous on the lower surface) 1.2–4.8 mm. broad, up to 3.5 dm. long; peduncles coarsely filiform, canaliculate, pilose, 0.7–1.2 dm. long, 1-few-flowered; ovary and capsule densely pilose; perianth with hairy elliptic segments 3–7.5 mm. long; capsule subcylindric to ellipsoidal, 5–13 mm. long; seeds 0.8–0.9 mm. in diameter, brown, the outer coat covered with sharp, prolonged murications; the black beak and hilum set in a lustrous, black, pyriform spot.—At high altitudes in Central Mexico. The following are referred here. San Luis Potosi: altitude 1830–2440 m. (6000–8000 feet), in region of San Luis Potosi, *Parry & Palmer*, no. 871, with seeds (hb. Gray, type, hb. U. S. Nat. Mus., hb. Phil. Acad., hb. Mo. Bot. Gard.); low ground about San Luis Potosi, *Schaffner*, no. 545, with seeds (hb. Gray).

This material was distributed as *H. decumbens* L. but it differs from that species in having a fibrous base and rigid, coarsely veined, densely pilose leaves as well as in having very different seeds.

10. **H. Wrightii** (Baker), n. comb. Corm subglobose, 6–12 mm. thick, covered with membranous and somewhat fibrillous brown sheaths; leaves linear, canaliculate or involute, 0.4–3 mm. broad, up to 2.6 dm. long; peduncles filiform, pilose, 0.4–1.2 dm. long, 1–2-flowered; ovary and capsule densely pilose; perianth with lanceolate to narrowly elliptic, acutish segments, 0.4–8.1 cm. long; capsule subglobose or ellipsoidal, 4–6 mm. long; seeds 0.8–1.1 mm. in diameter, black, lustrous, the outer coat covered with flattened, truncated and crudely carved pebbling.—*H. juncea*, var. *Wrightii* Baker, Journ. Linn. Soc. xvii. 106 (1878).—Florida Keys, Bahama Islands and the West Indies. The following are referred here. Florida Keys: Pinelands, Big Pine Key, *J. K. & G. K. Small*, no. 5028, with seeds (hb. N. Y. Bot. Gard.). Bahama Islands: moist, loamy clay and honeycomb limestone, pine region, about five miles southwest of Nassau, *A. E. Wight*, no. 271, without seeds (hb. Gray); New Providence, grassy places, race course, *N. L. Britton & L. J. K. Brace*, no. 286, with seeds (hb. N. Y. Bot. Gard.). Cuba: *C. Wright*, no. 3745 (distributed as *H. juncea*, var. *Wrightii*, with seeds, hb. Gray, hb. U. S. Nat. Mus., without seeds hb. N. Y. Bot. Gard.); near Monte Verde in eastern Cuba, *C. Wright*, January–July, 1859 (hb. Gray); province of Pinar del Rio between Pinar del Rio and Coloma, *N. L. Britton, E. G. Britton & J. F. Cowell*, no. 10062, without seeds (hb. N. Y. Bot. Gard.). Isle of Pines: *A. A. Taylor*,

FIG. 11. H. Wrightii and seed (left).
H. rugosperma and seed (right).

no. 71, without seeds (hb. U. S. Nat. Mus.); Neuva Gerona, *A. H. Curtiss*, without seeds (hb. N. Y. Bot. Gard.). PORTO RICO: near Bayamon, *Sintenis*, no. 1067, without seeds, (distributed as *H. de-*

cumbens L., hb. U. S. Nat. Mus.). The plants in the list above, unless otherwise marked, were distributed as *H. juncea* Smith.

H. juncea, var. *Wrightii* was the name given by Baker to number 239, collected by Charles Wright in Cuba, because it differed from true *H. juncea* in having the capsule sparsely pilose and the outer leaves disintegrating into setaceous fibers. I have not seen number 239. In the specimens that I have examined, the leaves of *H. juncea* may frequently disintegrate more or less into fibers at the base, but the Cuban plants always show this disintegration of their outer leaves. Superficially, although the leaves of the Cuban plants are very narrow, those of *H. juncea* are even narrower and appear filiform. Also the seeds are very different. *H. juncea* has black seeds with murications truncated and sharply sculptured, but the Cuban plant has drab seeds marked with low, flat or corrugated pebbling. I have seen no West Indian specimens with the characteristic seeds of *H. juncea*; therefore I am raising var. *Wrightii* to specific rank.

11. **H. rugosperma**, n. sp., cormo globoso vel subcylindrato 0.6–1.5 cm. crasso, foliis exterioribus basi in fasciculo brunneo fibrarum dissolutis; foliis lineari-lanceolatis apice acutis pilosis 1.7–5 mm. latis usque 2.7 dm. longis; pedunculis subfiliformibus canaliculatis pilosis 0.4–1.2 dm. longis pauci-floris; ovario capsulaque dense pilosis; segmentis perianthii anguste ellipticis vel lanceolatis acutis 3–7 mm. longis; capsulis subcylindratis vel ellipsoideis 6–9 mm. longis; seminibus 0.8–1 mm. diametro brunneis, testa vesicula persistenti jugis confluentibus tenuibus et paullo rugosis irregulariter instructa.

Corm globose to subcylindric, 0.6–1.5 cm. thick; the outer leaves breaking up at the base into tufts of brown fibers: leaves linear-lanceolate, with an acute apex, pilose, 1.7–5 mm. broad, up to 2.7 dm. long; peduncles coarsely filiform, canaliculate, pilose, 0.4–1.2 dm. long; ovary and capsule densely pilose; perianth-segments narrowly elliptic or lanceolate, acute, 3–7 mm. long; capsule subcylindric or ellipsoidal, 6–9 mm. long; seeds 0.8–1 mm. in diameter, brown; the outer coat loose, persistent, irregularly covered with confluent, thin, slightly jagged crests.—In mountainous regions of Mexico and Central America. The following are referred here. JALISCO: cliffs near Guadalajara, *C. G. Pringle*, no. 2908, with seeds (hb. Gray, TYPE). GUATEMALA: Santa Rosa, altitude 915 m. (3000 feet), *Heyde & Lux*, no. 2934, with seeds (two sheets in hb. U. S. Nat. Mus., hb. Gray).

This material was distributed as *H. decumbens* L. but is easily distinguished from that species by its fibrous base and more pilose leaves as well as by its seeds.

12. **H. fibrata**, n. sp., cormo globoso vel subcylindrato 7–19 mm. crasso vaginis membranaceis brunneis et dense fibratis investo; foliis linearibus subrigidis 1.8–5 mm. latis 0.6–2.5 dm. longis pilosis;

FIG. 12. H. fibrata and seed (left).
H. humilis and seed (right).

pedunculis pilosis filiformibus 1.5–15 cm. longis uni- vel pauci-floris; ovario capsulaque dense pilosis; segmentis perianthii anguste ellipticis 3–6 mm. longis; capsulis subcylindratis 5–9 mm. longis; seminibus brunneis processis firmis conicis subtruncatis haud confluentibus obsitis.

Corm globose to subcylindric, 7–19 mm. thick, covered with brown, membranous sheaths and dense fibers; leaves linear, rather rigid, 1.8–5 mm. broad, 0.6–2.5 dm. long, pilose; peduncles pilose, filiform, 1.5–15 cm. long, 1-few-flowered; ovary and capsule densely pilose, perianth-segments narrowly elliptic, 3–6 mm. long; capsule subcylindric, 5–9 mm. long; seeds brown, covered by firm, conical, rather truncated scarcely confluent processes.—Throughout Mexico. The following is selected as the TYPE of this species. PUEBLA: vicinity of Puebla, *Bro. Nicolas*, no. 5203, with seeds (hb. Gray, hb. Mo. Bot. Gard.). The following, although frequently without good seeds, are referred here. CHIHUAHUA: in the Sierra Madre, near Colonia Garcia, *C. H. T. Townsend & C. M. Barber*, no. 70 (hb. N. Y. Bot. Gard., hb. Mo. Bot. Gard., hb. U. S. Nat. Mus., hb. Gray). VERA CRUZ: near Santa Fé, *J. N. Rose & Robert Hay*, no. 5374 (hb. U. S. Nat. Mus.). JALISCO: Tapalpa, *Marcus E. Jones*, no. 469 (hb. U. S. Nat. Mus., hb. Mo. Bot. Gard.). MEXICO: near Tultenango, *J. N. Rose & Robert Hay*, no. 5442 (hb. U. S. Nat. Mus.); Valley of Mexico, Pedregal near San Angel, *J. N. Rose & Walter Hough*, no. 4510 (hb. U. S. Nat. Mus.). MORELOS: Cuernavaca, *Chas. C. Deam*, no. 44 (hb. Gray). PUEBLA: vicinity of Puebla, *Bro. G. Arsène*, no. 1138 (hb. Gray, hb. Mo. Bot. Gard., hb. N. Y. Bot. Gard.). LOCALITY UNKNOWN: one sheet with very good seeds in the Gray herbarium.

This material was distributed mostly as *H. breviscapa* HBK. or sometimes as *H. decumbens* L.

13. H. HUMILIS HBK. Corm globose to subcylindric, 5–11 mm. thick, covered with brownish membranous or fibrillous sheaths; leaves linear, canaliculate and densely pilose, 0.8–2.8 mm. broad, up to 3.5 dm. long; peduncles filiform, pilose, 1–18 cm. long, 1–2-flowered; ovary and capsule densely pilose; perianth-segments narrowly elliptic, 3–5 mm. long; capsule subglobose, 3–6 mm. long; seeds 0.8–1.1 mm. in diameter, brown, the outer coat covered with numerous, firm, sharp-pointed murications; the beak and hilum small and black. —Nov. Gen. et. Sp. Pl. i. 286 (1815). *Niobea pratensis* Willd. ex Schultes, Syst. Veg. vii. 762 (1830).—Fields in Mexico and South America. The following are referred here. HIDALGO: *Dr. Coulter*,[1] nos. 1546 and 1565, with seeds (hb. Gray). CHIAPAS: *C. A. Purpus*, no. 6966, with seeds (hb. Gray, hb. N. Y. Bot. Gard.). COLOMBIA: southwest of Las Cruces, Bogotá, altitude 2600–2700 m. (7931–8236

[1] According to Hemsley in *Biologia Centrali-Americana, Botany*, iv. Dr. Thomas Coulter "collected in California from 1831–1833, and then in Sonora . . . He also collected largely in Zimapan and Real del Monte, where he was Surgeon to one of the Mining Companies; but this appears to have been previous to his visit to California. His collection went to Trinity College, Dublin . . After Coulter's death in 1843, Harvey distributed the duplicates of the collection, and the first set is at Kew." Since the two specimens in the Gray Herbarium do not seem like other north Mexican species probably they came from either Zimapan or Real del Monte both of which are in the state of Hidalgo.

ft.), *F. W. Pennell*, no. 2163, with seeds (hb. Gray, hb. N. Y. Bot. Gard.); plateau de Sta. Fé de Bogotá, 1861, ex herb. Parseval-Grandmaison, with seeds (hb. Gray.). Ecuador: Quitensian Andes, *J. P. Couthouy*, 1855 (hb. Gray). Bolivia: *Miguel Bang*, no. 1793, with seeds (hb. N. Y. Bot. Gard., hb. Mo. Bot. Gard., hb. Gray, hb. U. S. Nat. Mus.); *G. Mandon*, no. 1208, with seeds (hb. Gray, hb. N. Y. Bot. Gard.). Argentina: *F. Kurtz*, no. 8386, with seeds (hb. N. Y. Bot. Gard.).

This material was distributed as *H. decumbens* L., *H. pusilla* HBK., and *H. humilis* HBK.

14. H. mexicana Schultes. Corm globose to subcylindric, 3–12 mm. thick, the membranous bases of the old leaves frequently forming somewhat fibrillous tufts; leaves linear-lanceolate, pilose, 1.2–4 mm. broad, up to 3.2 dm. long; peduncles filiform, canaliculate, densely pilose above, glabrescent below, 1.5–18 cm. long, 1–several-flowered; ovary and capsule densely pilose; perianth-segments linear or narrowly elliptic, 3–8 mm. long; capsule globose to subcylindric, 2.5–15 mm. long; seeds 0.8–1.1 mm. in diameter; the outer coat brown, muricate, with long, sharp processes, irregularly exfoliating in patches showing the black coat beneath; the beak and hilum prominent and black.—Schultes in Roemer and Schultes, Syst. Veg. vii. 761 (1830). —Along the bases of the mountain ranges of Mexico, northward into Arizona. The following are referred here. Vera Cruz: near Santa Fé, *J. N. Rose & Jos. H. Painter*, no. 6522, without seeds (hb. U. S. Nat. Mus.); Orizaba, ex herb. Mus. Paris, no. 2830, without seeds (hb. Gray). Tlaxcala: Contadero, *J. N. Rose & Robert Hay*, no. 5967, without seeds (hb. U. S. Nat. Mus.). Mexico: near Toluca, *J. N. Rose & Jos. H. Painter*, no. 6776, with seeds (hb. U. S. Nat. Mus.); Cima, *J. N. Rose & Jos. H. Painter*, no. 7187, without seeds (hb. U. S. Nat. Mus.); near Eslava, lava beds, altitude 2440 m. (8000 feet), *Rusby*, no. 339, with seeds (hb. N. Y. Bot. Gard.); near Eslava, *J. N. Rose & Jos. H. Painter*, no. 7140, with seeds (hb. U. S. Nat. Mus.); on Popocatepetl, *J. N. Rose & Robert Hay*, no. 6307, with seeds (hb. U. S. Nat. Mus.); Amecameca, *C. A. Purpus*, no. 1834, with seeds (hb. U. S. Nat. Mus., hb. Mo. Bot. Gard., hb. Gray). Hidalgo: between Pachuca and Real del Monte, *J. N. Rose & Jos. H. Painter*, no. 6683, with seeds (hb. U. S. Nat. Mus.); between Somoriel and Las Lajas, *J. N. Rose & Jos. H. Painter*, no. 9219, without seeds (hb. U. S. Nat. Mus.). Sinaloa: in the foothills of the Sierra Madre, near Colomas, *J. N. Rose*, no. 1655, with seeds (hb. U. S. Nat. Mus.). Chihuahua: damp places, pine plains, base of the Sierra Madre, *C. G. Pringle*, no. 1380, with seeds (hb. N. Y. Bot. Gard., hb. U. S. Nat. Mus., nos. 932928 and 36590, hb. Gray, hb. Phil. Acad.); near Colonia Garcia, *E. W. Nelson*, no. 6127, with seeds (hb. U. S. Nat. Mus.). Arizona: near Fort Huachuca at Tanner's Cañon, in sod, *Lemmon*, no. 2891, with seeds (hb. Gray);

Huachuca Mts., *J. G. Lemmon & wife*, with seeds (hb. U. S. Nat. Mus.).

This material was distributed as *H. decumbens* L.

FIG. 13. H. mexicana and seed (left).
H. catamarcensis and seed (right).

15. **H. catamarcensis**, n. sp., cormo subgloboso vel subcylindrato 5–9 mm. crasso vaginis membranaceis brunneis et saepe fibrillatis investo; foliis lineari-lanceolatis 1–3 mm. latis 1–1.9 dm. longis, pilosis; pedunculis filiformibus laxe adscendentibus vel recurvantibus 3.5–5 cm. longis, villosis praesertim ad apicem, uni- vel pauci-floris; ovario capsulaque sparse pilosis; segmentis perianthii lanceolatis ellipticis 3–5 mm. longis; pedicellis 3–6 mm. longis; capsulis subcylin-

dratis vel paullo ellipsoideis plerumque subglabris maturitate 4–6 mm. longis; seminibus 0.8–1 mm. diametro atris, partim parvis naevis testae brunneae investis.

Corm subglobose to subcylindric, 5–9 mm. thick, covered with membranous and often fibrillous brown sheaths; leaves linear-lanceolate, 1–3 mm. broad, 1–1.9 dm. long, pilose; peduncles filiform, loosely ascending or recurving, 3.5–5 cm. long, villous especially above, 1–few-flowered; ovary and capsule sparsely pilose; perianth-segments lanceolate, elliptic, 3–5 mm. long; pedicels 3–6 mm. long; capsule subcylindric or ellipsoid, usually rather glabrate at maturity, 4–6 mm. long; seeds 0.8–1 mm. in diameter, black, partially covered with small patches of a brown outer coat.—In northern Argentina. The following is referred here as the TYPE of this species. CATAMARCA: from the department of Andalgalá, *P. Jörgensen*, no. 1551, with seeds (hb. Gray, hb. U. S. Nat. Mus., hb. Mo. Bot. Gard.).

It was distributed as *H. decumbens* L.

(*To be continued*).

CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY.

NEW SERIES.—No. LXIX.

A. BRACKETT.

(Continued from page 147.)

LIST OF EXSICCATAE (HYPOXIS).

A. P. Anderson.
1265 hirsuta (L.) Coville.

L. Andrews.
487 hirsuta (L.) Coville.

Arsène.
1138 fibrata Brackett.

C. C. Bachman.
2120 hirsuta (L.) Coville.

S. M. Bain.
231 hirsuta (L.) Coville.

Miguel Bang.
1042 breviscapa HBK.
1793 humilis HBK.

G. Baur.
239 decumbens L.

W. Beach.
121 hirsuta (L.) Coville.

Berlandier.
1832 hirsuta (L.) Coville.

Biltmore Herbarium.
529 hirsuta (L.) Coville.
529[a] hirsuta (L.) Coville, var. leptocarpa (Engelm. & Gray) Brackett.
529[b] hirsuta (L.) Coville.
529[c] " " "
529[d] hirsuta (L.) Coville, var. leptocarpa (Engelm. & Gray) Brackett.
529[e] hirsuta (L.) Coville.
529[f] " " "
2527[a] juncea Smith.
2527[c] " "
2527[d] " "
2527[e] " "
4015 hirsuta (L.) Coville, var. leptocarpa (Engelm. & Gray) Brackett.

O. W. Blakley.
1408 hirsuta (L.) Coville.
3433 " " "

Botteri.
80 decumbens L., var. major Seubert.
455 decumbens L., var. major Seubert.
463 decumbens L., var. major Seubert.

Bourgeau.
2830 mexicana Schultes.

M. A. Brannon.
183 hirsuta (L.) Coville.

W. L. Bray.
68 rigida Chapman.
103 hirsuta (L.) Coville.

Britton.
2285 decumbens L.

Britton and Brace.
286 Wrightii (Baker) Brackett.

Britton, Britton and Cowell.
10062 Wrightii (Baker) Brackett.

Britton and Cowell.
208 decumbens L.

Britton, Britton and Earle.
6301 decumbens L.

Britton and Hazen.
24 decumbens L.

Britton and Hess.
2811 decumbens L.

Britton, Britton and Shafer.
102 juncea Smith.

Britton and Shafer.
279 decumbens L.
779 " "

Britton, Wilson and Selby.
14332 micrantha Pollard.

Broadway.
220 decumbens L.
4724 " "

Mr. and Mrs. H. I. Brown and F. C. Seymour.
1901 hirsuta (L.) Coville.

Bush.
55 hirsuta (L.) Coville.
295 " " "
316 " " "
385 hirsuta (L.) Coville, var. leptocarpa (Engelm. & Gray) Brackett.
525 hirsuta (L.) Coville.
973 " " "
1441 " " "
1598 " " "
4237 " " "

J. J. Carter.
280 hirsuta (L.) Coville.

Bro. Leon and F. R. Cazanas.
5920 Wrightii (Baker) Brackett.

A. W. Chapman.
510 hirsuta (L.) Coville.
Clute.
208 decumbens L.
T. Coulter.
1546 humilis HBK.
1565 " "
J. F. Cowell.
521 decumbens L.
A. H. Curtiss.
2837* hirsuta (L.) Coville, var. leptocarpa (Engelm. & Gray) Brackett.
2838 juncea Smith.
4167 " "
4573 " "
4727 hirsuta (L.) Coville, var. leptocarpa (Engelm. & Gray) Brackett.
John Davis.
1231 hirsuta (L.) Coville.
3308 " " "
5156 " " "
6621 " " "
7283 " " "
7393 " " "
M. A. Day.
24 hirsuta (L.) Coville.
71 " " "
Deam.
44 fibrata Brackett.
L. H. Dewey.
205 hirsuta (L.) Coville.
R. A. Dixon and L. C. Gage.
679 hirsuta (L.) Coville.
Drummond.
342 hirsuta (L.) Coville, var. leptocarpa (Engelm. & Gray) Brackett.
417 hirsuta (L.) Coville.
Père Duss.
2011 decumbens L.
3317c " "
Earle and Baker.
1490 hirsuta (L.) Coville.
Eggers.
615 decumbens L.
W. H. Emig.
324 hirsuta (L.) Coville.
Fendler.
1565 decumbens L., var. major Seub.
Fiebrig.
891 decumbens L., var. major Seubert.
5047 decumbens L.
5177 " "
B. Fink.
84 hirsuta (L.) Coville.
G. L. Fisher.
41 micrantha Pollard.
M. J. Fisher.
54 decumbens L.

W. C. Fishlock.
113 decumbens L.
Fredholm.
315 juncea Smith.
3138 decumbens L.
5010 juncea Smith.
6123 " "
6043 hirsuta (L.) Coville, var. leptocarpa (Engelm. & Gray) Brackett.
Fuertes.
1704 decumbens L.
C. Gates.
1553.3 hirsuta (L.) Coville.
A. Gershoy.
778 hirsuta (L.) Coville.
G. Gardner.
133 decumbens L.
H. A. Gleason.
2281 hirsuta (L.) Coville.
P. Goll.
306 decumbens L.
Greenman.
100 hirsuta (L.) Coville.
550 " " "
2323 " " "
2329 " " "
3868 " " "
Greenman, Lansing and Dixon.
39 hirsuta (L.) Coville.
Hale.
169 hirsuta (L.) Coville.
E. Hall.
631 hirsuta (L.) Coville.
632 micrantha Pollard.
W. H. Haller.
829 hirsuta (L.) Coville.
R. M. Harper.
1268 hirsuta (L.) Coville.
1365 hirsuta (L.) Coville, var. leptocarpa (Engelm. & Gray) Brackett.
1604 juncea Smith.
1880 hirsuta (L.) Coville.
W. Harris.
8589 decumbens L., var. major Seubert.
9100 decumbens L., var. major Seubert.
9401 decumbens L., var. major Seubert.
12059 decumbens L.
Hart.
366 decumbens L.
Hassler.
1178 decumbens L.
3245 " "
5562 " "
Mr. and Mrs. A. A. Heller.
182 decumbens L.
982a " "

Heyde and Lux.
2871 decumbens L.
2934 rugosperma Brackett.

Hitchcock.
343 juncea Smith.

Holm.
67 decumbens L.

House.
687 hirsuta (L.) Coville.
1984 " " "
2523 " " "
4157 " " "
5173 " " "

O. H. Howell.
653 hirsuta (L.) Coville.

Hus.
4107 hirsuta (L.) Coville.

M. E. Jones.
469 fibrata Brackett.

Jörgensen.
1551 catamarcensis Brackett.

J. R. Johnston.
36 decumbens L.

Kearney.
1035 hirsuta (L.) Coville.
1265 " " "
1378 " " "

J. H. Kellogg.
531 hirsuta (L.) Coville.

E. P. Killip.
3570 decumbens L.

A. F. K. Krout.
2837 hirsuta (L.) Coville.

F. Kurtz.
8386 humilis HBK.

Langlois.
332 rigida Chapman.

Lehmann.
7599 decumbens L.

Lemmon.
2891 mexicana Schultes.

Lighthipe.
470 juncea Smith.

Lindheimer.
185 hirsuta (L.) Coville, var leptocarpa (Engelm. & Gray) Brackett.
187 sessilis L.
188 hirsuta (L.) Coville, var leptocarpa (Engelm. & Gray) Brackett.

F. E. Lloyd.
579 decumbens L.

Bayard Long.
3444 hirsuta (L.) Coville.
3784 " " "
5904 " " "
6975 " " "
7177 " " "

Long and Brown.
148 hirsuta (L.) Coville.
3536 hirsuta (L.) Coville.

MacElwee.
308 hirsuta (L.) Coville.

J. Macoun.
13799 hirsuta (L.) Coville.

Mandon.
1208 humilis HBK.

Maxon.
798 decumbens L.
6139 hirsuta (L.) Coville.

Maxon and Standley.
96 hirsuta (L.) Coville.

McCarthy.
8 micrantha Pollard.

E. A. Means.
74 micrantha Pollard.

M. Meislahn.
1698 juncea Smith.

E. L. Morris.
210 hirsuta (L.) Coville.

J. R. Mumbauer.
407 hirsuta (L.) Coville.

Nash.
488 decumbens L.
789 juncea Smith.
952 " "
2072 " "

Nash and Taylor.
1183 decumbens L.

E. W. Nelson.
6127 mexicana Schultes.

G. E. Nichols.
69 decumbens L.

Nicolas.
5203 fibrata Brackett.

J. B. Norton.
165 hirsuta (L.) Coville.

L. B. Ohlinger.
599 juncea Smith.

J. H. Oyster.
3852 hirsuta (L.) Coville.

Edward Palmer.
232 decumbens L.
557 juncea Smith.
581 decumbens L., var. major Seubert.

E. J. Palmer.
694 hirsuta (L.) Coville.
695 " " "
1566 rigida Chapman.
5316 micrantha Pollard.
7380 " "
8519 hirsuta (L.) Coville, var. leptocarpa (Engelm. & Gray) Brackett.
9357 hirsuta (L.) Coville.
9520 hirsuta (L.) Coville, var. leptocarpa (Engelm. & Gray) Brackett.
13406 hirsuta (L.) Coville.
15114 " " "

E. L. Palmer.
322 hirsuta (L.) Coville.
Parry and Palmer.
871 potosina Brackett.
W. Palmer.
90 hirsuta (L.) Coville.
A. S. Pease.
12552 hirsuta (L.) Coville.
Pennell.
1346 hirsuta (L.) Coville.
2163 humilis HBK.
2552 hirsuta (L.) Coville.
2808 " " "
4998 " " "
Pennell and Long.
7812 hirsuta (L.) Coville.
Pollard.
21 hirsuta (L.) Coville.
200 " " "
Pollard and Maxon.
72 hirsuta (L.) Coville.
90 " " "
Pretz.
2971 hirsuta (L.) Coville.
3411 " " "
7097 " " "
10354 " " "
Pretz, Mattern and Long.
6556 hirsuta (L.) Coville.
Pringle.
1380 mexicana Schultes.
2908 rugosperma Brackett.
Purpus.
1834 mexicana Schultes.
6966 humilis HBK.
Redfield.
7933 hirsuta (L.) Coville.
7934 " " "
A. F. Regnell.
1237 decumbens L.
Reniech.
99 decumbens L.
Reverchon.
948 hirsuta (L.) Coville.
2759 rigida Chapman.
2759A hirsuta (L.) Coville.
2760 " " "
2760A " " "
2780 rigida Chapman.
4028 hirsuta (L.) Coville.
4038 " " "
9481 " " "
E. S. Reynolds.
067 hirsuta (L.) Coville.
Riehl.
126 hirsuta (L.) Coville.
B. L. Robinson.
176 sessilis L.
352 hirsuta (L.) Coville.
353 hirsuta (L.) Coville.
709 " " "
Rolfs.
255 juncea Smith.
Rose.
1655 mexicana Schultes.
3307 tepicensis Brackett.
3319 " "
Rose and Hay.
5374 fibrata Brackett.
5442 " "
5967 mexicana Schultes.
6142 decumbens L.
6307 mexicana Schultes.
Rose and Hough.
4326 decumbens L., var. major Seubert.
4510 fibrata Brackett.
Rose, Fitch and Russell.
3346 decumbens L.
Rose, Painter and Rose.
9219 mexicana Schultes.
Rose and Painter.
6522 mexicana Schultes.
6683 " "
6776 " "
7140 " "
7187 " "
7237 decumbens L.
Rugel.
132 sessilis L.
Rusby.
339 mexicana Schultes.
Ruth.
155 hirsuta (L.) Coville.
156 " " "
Rydberg.
8218 hirsuta (L.) Coville.
Safford.
80 hirsuta (L.) Coville.
B. F. Saurman.
7937 juncea Smith.
J. H. Schuette.
139 hirsuta (L.) Coville.
F. C. Seymour.
1157 hirsuta (L.) Coville.
Shafer.
3239 decumbens L.
W. C. Shannon.
4721 decumbens L.
Small and Small.
5028 Wrightii (Baker) Brackett.
Small and Wilson.
1871 micrantha Pollard.
J. D. Smith.
342 juncea Smith.
343 hirsuta (L.) Coville, var. leptocarpa (Engelm. & Gray) Brackett.

H. H. Smith.
2266 decumbens L., var. major Seubert.
H. H. Smith and G. W. Smith.
14 decumbens L.
U. C. Smith.
1405 hirsuta (L.) Coville.
M. P. Somes.
3067 hirsuta (L.) Coville.
Spruce.
5068 decumbens L.
J. P. Standley.
7 juncea Smith.
499 " "
P. C. Standley.
11381 hirsuta (L.) Coville.
12963 juncea Smith.
Standley and Bollman.
12097 hirsuta (L.) Coville.
L. D. Starr.
2817 hirsuta (L.) Coville.
A. Stewart.
1135 decumbens L.
W. Stone.
72 micrantha Pollard (in part).
Schaffner.
506 humilis HBK.
545 potosina Brackett.
Sintenis.
488 decumbens L.
1067 Wrightii (Baker) Brackett.
F. C. Straub.
52 juncea Smith.
A. A. Taylor.
71 Wrightii (Baker) Brackett.
Alexandrina Taylor.
4227 decumbens L.
Tonduz.
7280 decumbens L.
8028 " "
Townsend and Barber.
70 fibrata Brackett.
Tracy.
5090 rigida Chapman.
5091 " "
5092 " "
5093 " "
5095 micrantha Pollard.
6418 " "
6621 hirsuta (L.) Coville, var. leptocarpa (Engelm. & Gray) Brackett.
6866 juncea Smith.
7514 " "
9231 hirsuta (L.) Coville.
H. von Tuerckheim.
33 decumbens L., var. major Seubert.
3842 decumbens L., var. major Seubert.
Underwood and Griggs.
785 decumbens L.
956 " "
977 " "
L. F. Ward.
137 hirsuta (L.) Coville.
A. E. Wight.
271 Wrightii (Baker) Brackett.
T. Williams.
74 hirsuta (L.) Coville.
C. S. Williamson.
103 hirsuta (L.) Coville.
1513 " " "
Percy Wilson.
347 decumbens L.
C. Wright.
1515 decumbens L.
3745 Wrightii (Baker) Brackett.
Wright, Parry and Brummel.
530 decumbens L.

II. SOME GENERA CLOSELY RELATED TO HYPOXIS.

Previous to 1762 the plants now known as *Hypoxis* were scattered among the genera *Anthericum*, *Crocus*, *Ornithogalum*, *Allium* etc. Linnaeus in the first edition of his *Species Plantarum* (1753) had thus distributed them but in his second edition (1762) he formed under *Hexandria Monogynia* the genus *Hypoxis* with four species. In his *Philosophia Botanica* (1751) he had proposed a fragment of a Natural System of classification and in Sprengel's edition of this work (1809) *Hypoxis* was added to the class *Coronariae*.

Jussieu in 1789 published his *Genera Plantarum* in which he proposed a system of classification supposed to be more natural than the one of Linnaeus because the whole structure of the plant was taken into

consideration. In this, under Class III *Perigyna*, Order VII *Narcissi* of his Monocotyledons, he placed the genus *Hypoxis*.

Robert Brown in his *Prodromus* (1810) formed the family *Amaryllideae* and under the heading "Genera inter Asphodeleas et Amaryllideas media" placed the genera *Hypoxis*, *Curculigo* Gaertner and *Campynema* Labillardière. Later in his *General Remarks on the Botany of Australia* (1814), he said, "it is better to consider *Curculigo* and *Hypoxis* as forming a separate family." This family he proposed to call the *Hypoxideae*, characterized by "*Perianthium* superum limbo sexpartito, regulari, aestivatione imbricata. *Stamina* sex, imis lacinis inserta. *Ovarium* 3-loc. loculis polyspermis. *Capsula* evalvis, nunc baccata, polysperma. Semina umbilico laterali rostelliformi: testa atra crustacea. *Embryo* in axi albuminis carnosi: radicula vaga."

Curculigo was described by Gaertner in 1788 with the species *C. orchioides*, a plant which had previously been considered an orchid. Jussieu in 1789 made no mention of this new genus but later Robert Brown classed it with *Hypoxis* as above stated.

Campynema was described by Labillardière (1804) as a new genus based upon a plant from Tasmania which he called *C. linearis*. Since it has a leafy stem and its seeds are very different from those of *Hypoxis* it seems unwise to place these two genera together.

John Lindley in his *Introduction to a Natural System of Botany* (1831) placed *Curculigo* and *Hypoxis* under the order *Hypoxideae*. Later in his *Natural System of Botany* (1836) he placed the *Hypoxideae* as a family under the order *Amaryllidaceae* and he said, "I give up the possibility of characterizing Hypoxideae as a distinct Order, for their occasionally rostellate seeds appear of no value as an ordinal distinction." All of the American species of *Hypoxis* and *Curculigo* have rostellate seeds and Baker says the Old World species of both likewise have them. So by including plants without rostellate seeds Lindley seems to have brought together some unrelated genera when he placed *Curculigo* including *Molineria* Colla, *Hypoxis* including *Fabrica* Thunberg and "*Caelanthus* Schlectendal" (originally published *Coelanthus* Willd.) under the family *Hypoxideae*.

Colla (1825) described *Molineria*, with *M. plicata* as type, and observed that it had been considered a *Curculigo* but that it differed from the latter in several respects. He listed the differences and also gave a figure of his plant. From his plate and from specimens of

similar appearance it seems that he over-estimated some of these differences. For instance, he stated that the seed of his plant is "inappendiculata . . . non rostratum," as is the seed of *Curculigo orchioides* which must be taken as the type for the genus *Curculigo*. Nevertheless, when a *Molineria* seed is seen under a microscope the beak and rostrate hilum are clearly discernible. They are obscured to the unaided eye by the uneven contour of the whole seed.

Coelanthus has the flowers in racemes, a superior ovary and is generally referred to the genus *Lachenalia* of the *Liliaceae*.

In 1847 in his *Vegetable Kingdom* under the alliance *Nacissales* Lindley again made the *Hypoxidaceae* a separate order, between the *Haemodoraceae* and the *Amaryllidaceae*. He characterized it by "Flowers hexapetaloideous, much imbricated. Stamens 6; anthers turned inwards. Radicle remote from the hilum, which is often strophiolate." Under this order he placed the genera *Curculigo*, *Forbesia* Ecklon, *Pauridia* Harvey and *Hypoxis*. This time he put "*Coelanthus* W." among the *Liliaceae*.

I have been unable to see Ecklon's description of *Forbesia* but later botanists have included it under *Curculigo* and Baker, who also did this, stated that the seeds of *Curculigo* are rostellate.

William Herbert (1837) placed the *Hypoxideae* as a suborder under his caulescent *Amaryllidaceae*. This suborder he divided further, and under his division *Hypoxidiformes*, characterized by "sepals and petals conformable," he placed the genera ? *Weldenia* Schultes fil., *Curculigo*, *Molineria*, *Hypoxis* and *Coelanthus*.

Weldenia has been placed since in the *Commelinaceae* which it resembles in habit and leaves.

In his *Flora Australiensis* (1873) Bentham formed the order *Amaryllideae* characterized by "Flowers regular or nearly so. Anthers opening inwards. Placentas axile. Seeds albuminous. Inflorescence centripetal. Leaves chiefly radical, veinlets when present transverse." He distinguished five tribes, *Haemodoreae*, *Conostyleae*, *Hypoxideae*, *Agaveae* and *Euamaryllideae*. He said, "The several tribes here distinguished are usually considered as so many independent Orders, or at any rate as referrible to three distinct Orders—*Haemodoraceae*, *Hypoxideae*, and *Amaryllideae*; but although these subordinate groups are in most respects distinct, it appears to me that it is only by their union in one general Order that we can obtain a

well-defined group, of the same grade as *Irideae*, *Burmanniaceae*, *Orchideae*, *Scitamineae* and *Hydrocharideae*, all of them clearly marked out by definite and important characters. It is generally admitted that the above suborders, here united under the *Amaryllideae*, agree in the most important characters derived from the flower and seed, differing from *Hydrocharideae*, *Orchideae* and *Burmanniaceae* in their albuminous seeds, from *Scitamineae* and *Orchideae* in their regular (or only oblique) flowers, from *Irideae* and *Burmanniaceae* in their centripetal (not centrifugal) inflorescence and in their stamens, from *Taccaceae* and the majority of *Orchideae* and *Burmanniaceae* in their axile placentum, from *Dioscorideae* in their hermaphrodite flower, and in all cases there are other characters either less constant or of minor importance . . . Taking therefore the *Amaryllideae* as a whole as one Order, it would include besides the five tribes or suborders here enumerated . . . the *Vellozieae* . . . and the *Alstroemierieae* . . . in which however the secondary inflorescence appears to be centrifugal." Under the tribe Hypoxideae he placed *Hypoxis* and *Curculigo*.

Bentham and Hooker in their *Genera Plantarum* (1883) made some changes in the five tribes of Bentham. These tribes they called *Hypoxideae*, *Amarylleae*, *Alstroemierieae*, *Agaveae* and *Vellosieae*. Under the *Hypoxideae* they placed the genera ? *Campynema*, ? *Pauridia*, *Hypoxis* and *Curculigo*.

Pax, writing in Engler and Prantl's *Die natürlichen Pflanzenfamilien* (1887), placed under the family *Amaryllidaceae* the subfamily *Hypoxidoideae*, and under the latter he placed the tribe *Hypoxideae*, containing the genera *Curculigo* and *Hypoxis*. He placed *Campynema* in a subfamily by itself parallel to the *Hypoxidoideae*; and *Pauridia* under the *Haemodoraceae* with the comment, that while Bentham and Hooker are not certain that it belongs in the *Amaryllidaceae*, neither is it certain that it is any better placed in the *Haemodoraceae*. The reason for all this uncertainty lies in the fact that while the plant has the habit and seeds of a tiny *Hypoxis* it has only three stamens.

Baker, in his *Synopsis of the Hypoxidaceae* (1878), followed the plan of Bentham and made the *Hypoxidaceae* a tribe of the *Amaryllidaceae*. Here he collected four genera *Hypoxis*, *Curculigo*, *Molineria* and *Pauridia*, which he characterized in the following manner:—

FIG. 14. Curculigo scorzoneraefolia.

"CLAVIS GENERUM.

****Perianthii tubus supra ovarium nullus vel brevissimus. Stamina epigyna.*

1. HYPOXIS. Fructus capsularis circumcissus operculatus. Folia sessilia haud plicata . . .

2. MOLINERIA. Fructus baccatus. Folia petiolata plicata . .

****Perianthii tubus supra ovarium productus. Stamina perigyna.*

3. CURCULIGO. Tubus elongatus filiformis. Stamina 6 . . .;

4. PAURIDIA. Tubus brevis infundibularis. Stamina 3 . . ."

These four genera have small, dark seeds, with a crustaceous outer coat and a beak and lateral rostrate hilum. Judging from the similarity of their seeds they should be classed together under the *Hypoxideae*. The seeds of this group are very different from those of the other *Amaryllidaceae* that I have examined and also from those of the neighboring families. However, my study has not been extensive enough to warrant removing the *Hypoxideae* from the *Amaryllidaceae*.

I am including a description and figures (habit × ½, seed × 40) of the American species of *Curculigo*; and also drawings (habit × ½, seed × 40) of the monotypic *Pauridia minuta* which appears to have

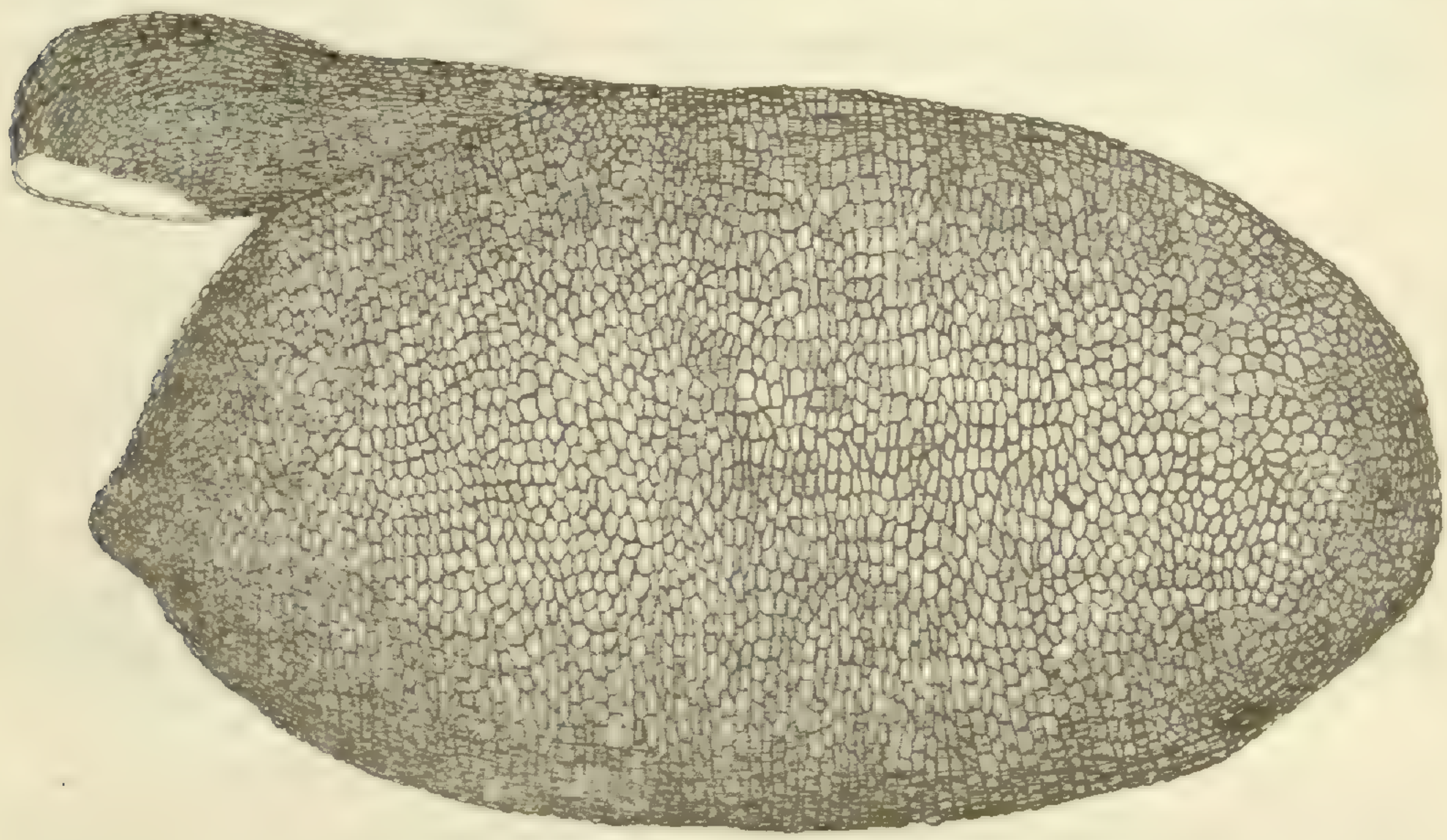

Fig. 15. Seed of Curculigo scorzoneraefolia.

a miniature *Hypoxis* seed. I also include figures (habit × ⅛, seed × 40) of *Molineria recurvata* (Ait. f.) Herbert (this is Colla's *M. plicata* renamed according to the international rules) to show that it is unlike *Curculigo* and while the seed appears to the unaided eye be "inappendiculata" it has really, when seen under even a low powered glass, the beak and rostrate hilum of the *Hypoxideae*.

Curculigo scorzoneraefolia (Lam.) Baker. Tuber cylindrical 2.5–above 8 cm. long, about 8 mm. thick, crowned with a tuft of fibers and the disintegrating membranous sheaths of the old leaf-bases; leaves pilose, linear to lanceolate, 1.5–14 mm. broad, 1–3.5 dm. long; in the broader-leaved plants the leaves narrowed to a petiolar base; scapes mostly one-flowered, 5–8.5 cm. long; pedicels very short, scarcely protruding from the tuft of basal fibers; bracts lanceolate, leaf-like, about 2 cm. long; ovary cylindrical when mature,

sheathed by the bracts and the whole encased by the basal fibers; perianth-tube filiform, 2–4 cm. long, pilose, crowned by the six spreading perianth-segments; perianth-segments lanceolate, 0.7–1.4 cm. long, pilose without; capsule indehiscent, cylindrical, subtended by the persistent bracts; seeds black, lustrous, subglobose, 2–2.5 mm. in diameter, with a small beak and a much expanded hilum.—Baker in Journ. Linn. Soc. xvii. 124 (1878). *Hypoxis scorzoneraefolia* Lamarck, Encyc. iii. 183 (1789).—Tropical and subtropical South America and the Antilles.

The accompanying drawings were made from a plant in the Gray Herbarium, collected by *R. Spruce* in the vicinity of Barra, Prov. Rio Negro, Brazil, Dec.–Mar., 1850–1851. Plants belonging to this species have mostly been distributed as *Hypoxis scorzoneraefolia* or as *Hypoxis decumbens* L. The leaves of this species are narrower and more grass-like than are those of most of the Old World Curculigos; yet the seed is as typically that of a *Curculigo* as in *C. orchioides* Gaertner around which the genus was described.

Pauridia minuta (L. f.) Durand & Schinz. Corm globose, 4–8 mm. thick, covered with membranaceous sheaths and the stiff bristly bases of the old leaves; leaves filiform to linear-lanceolate, 0.4–3.6 mm. broad, up to 3.5 cm. long; scapes 1(rarely 2)-flowered; pedicels longer than the peduncles and subtended by two setaceous bracts; ovary and capsule glabrous; perianth-segments 2–3.6 mm. long, lanceolate, slightly rounded at the apex; capsule subcylindric, 2–3 mm. long; seeds 0.1–0.2 mm. in diameter, black, lustrous, covered with minute rounded pebbling, making the seeds resemble a miniature seed of *Hypoxis hirsuta*, var. *leptocarpa*.—Consp. Fl. Afr. v. 142 (1895). *Ixia minuta* L. f. Suppl. 92 (1781); Thunb. Diss. Ixia. 6, t. 1, f. 1 (1783). *P. hypoxidioides* Harvey, Gen. S. Afr. Pl. 342 (1838).—About Cape Town, S. Africa. The following are cited here from near Cape Town; *Mac Owan & Bolus*, no. 291, with seeds (hb. Gray); *H. Bolus*, no. 2815, without seeds (hb. Gray).

Fig. 16. Pauridia minuta and seed.

Molineria recurvata (Ait. f.) Herbert. Tuber cylindrical, covered with the dark disintegrating sheaths of the old leaf-bases; leaves obovate, about 11 dm. long, about 8–13 cm. broad; the lower part narrowed at the base to form a petiole, densely villous when young, becoming glabrate at maturity; blade glabrate, acute; scapes about 2–3 dm. long, villous, bearing flowers and bracts in an oblong

deflexed head; pedicels about 7–16 mm. long; bracts leaf-like, villous at the apical margins; ovary and capsule cylindrical or subglobose;

FIG. 17. Molineria recurvata and seed.

perianth-segments linear-lanceolate, about 7 mm. long, pilose without; capsules indehiscent, 6–12 mm. long, cylindrical, subtended by

the persistent bracts which exceed the combined pedicel and mature capsule in length; seeds black, globose, about 2 mm. in diameter, with uneven contour; murications small, low and flat.—Amaryllideae 84 (1837). *Curculigo recurvata* Aiton f. Hort. Kew. ed. 2, ii. 253 (1811); Bot. Reg. ix. t. 770 (1823). *Molineria plicata* Colla, Hort. Rip. App. ii. 331, t. 18 (1825).—Tropical Asia, Australia and the Philippine Islands.

The drawing of this seed was made from specimen no. 18196, distributed by *A. D. E. Elmer*, and now in the Gray herbarium. It was collected in Los Baños (Mt. Maquiling), Province of Laguna, Island of Luzon, June–July, 1917. *Molineria* has been very often confused with *Curculigo* and the specimens have been distributed as *C. recurvata*, *C. gracilis* Kurz and *C. aquasanensis* Elmer.

CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY.

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I. STUDIES IN THE BORAGINACEAE,—II.

1. A Synopsis of the American native and immigrant Borages of the Subfamily Boraginoideae.

The following summary of the American *Boraginoideae* is the result, first, of a critical examination and study of the generic lines within the subfamily, and, second, of a careful study of the bibliography of the group and a serious attempt to identify as many as possible of the poorly understood or unidentified species. The data accumulated have been fashioned into a synopsis containing new keys to both genera and species, and such precise information as to specific distribution as available specimens and reliable records will permit. For the territory south of Mexico the occurrence of introduced species has been given by countries, but to the north the occurrence has been given by states. An attempt has been made to distinguish between reports based upon published records, and those founded upon specimens personally examined, all records of the latter sort being indicated by the exclamation sign. No attempt has been made to treat the genus *Cryptantha* which is being reserved for a subsequent paper. Such genera as *Amsinckia* or *Plagiobothrys* which have had recent revision are not treated in detail; instead, merely the reference to the latest published review has been cited.

The study of the South American members of the subfamily has been practicable only through the courtesy of Dr. W. R. Maxon and Dr. N. L. Britton who have loaned for my study, in conjunction with the material in the Gray Herbarium (G), that from South America contained in the United States National Herbarium (US) and the New York Botanical Garden (NY). Invaluable for my study of *Pectocarya* was the Southern Californian material of that genus contained in the Baker Herbarium of Pomona College (P) and loaned me by Dr. P. A. Munz.

Key to Genera.

Attachment of nutlet surrounded by a tumid annular rim, rather strongly convex or plug-like, leaving a pit upon the flat or low-convex gynobase. *Anchuseae.*

Stamens appendaged dorsally, closely crowded about the style; corolla rotate, suggesting that of a *Solanum* ..... 1. *Borago.*

Stamens unappendaged, included within the decidedly tubular corolla.

Corolla lacking faucal appendages or these represented by villous spots ..... 2. *Nonea.*

Corolla with definite faucal appendages formed by the intrusion of tissue.

Corolla broadly tubular; throat conspicuously developed and campanulate-dilated; lobes short, erect or with tips recurved; faucal appendages lanceolate, acute, margins denticulate.....3. *Symphytum*.
Corolla funnel- or salver-form; throat ill-defined, abruptly expanding or absent; lobes usually elongate, spreading or divergent; faucal appendages deltoid or oblong, obtusish, usually hairy.
Corolla-tube distinctly bent near middle, limb subirregular and oblique.....4. *Lycopsis*.
Corolla-tube straight, limb perfectly regular, not oblique.....5. *Anchusa*.
Attachment of nutlet without an annular rim, flat or somewhat concave, not leaving a pit on the gynobase.
Stigmas geminate or style bifid. *Lithospermeae*.
Corolla more or less irregular, oblique; stamens unequal.....6. *Echium*.
Corolla regular or only very obscurely irregular, stamens equal.
Calyx cylindrical, merely toothed; teeth short, triangular, not half length of tube, usually connivent over fruit; one nutlet normally developed this persistent and falling enclosed in calyx; pubescence in part of uncinate hairs.
Inflorescence naked, very dense.....7. *Moritzia*.
Inflorescence leafy-bracted, open.....8. *Thaumatocaryon*.
Calyx cut to near base; lobes linear or lanceolate, much longer than tube; four nutlets normally developed; these falling separately and not enclosed in the calyx, which is persistent; pubescence of straight hairs.
Corolla very large, 2.5–8 cm. long, lobes acute; stamens very long, reaching at least to corolla-sinuses and frequently much beyond.....9. *Macromeria*.
Corolla of small or medium size, less than 2.5 mm. long; stamens very short, included and not approaching corolla-sinuses.
Filaments ligulate; anthers densely hirsute dorsally; corolla-lobes short, rounded, erect.....10. *Lasiarrhenum*.
Filaments filiform; anthers glabrous.
Corolla-lobes acute or acuminate, erect; style long-exserted, protruded as the buds open; anthers sagittate.....11. *Onosmodium*.
Corolla-lobes rounded or obtuse, ascending or spreading or recurved; style included or short-exserted, never protruded until flower is fully opened; anthers oblong.
Nutlets attached to a flat gynobase by a large broad centered basal attachment, usually smooth and shiny but occasionally tuberculate-roughened; leaves alternate....12. *Lithospermum*.
Nutlets attached suprabasally and obliquely to a pyramidal gynobase or attached to a flat gynobase by a small strongly eccentric substipitate basal prolongation of the ventral keel, always tuberculate- or rugose-roughened, dull; lower leaves usually opposite.....13. *Antiphytum*.

Stigmas solitary and simple, capitate or disk-shaped, occasionally emarginate.
Nutlets attached near the apical end, divaricate or distinctly divergent, anterior face forming a right angle or a very broad acute angle with the floral axis. *Cynoglosseae*.
Dorsal surface of nutlets rather uniformly covered with glochidiate filiform or subulate appendages, rarely margined and then merely by a wrinkle in the pericarp.
Nutlets lenticular, very depressed; cauline leaves on slender petioles at least half as long as the deeply cordate blades; plants weak and trailing.....14. *Mimophytum*.
Nutlets turgid, usually compressed-ovoid; cauline leaves sessile or on very short winged petioles which are very much shorter than the linear to oblanceolate blades; plants erect.....15. *Cynoglossum*.
Dorsal surface of nutlets naked or occasionally covered with uncinate appendages, with a callous or chartaceous margin that is entire or serrate or with uncinately tipped subulate teeth or appendages.
Fruiting pedicels nodding or reflexed, coarse, stiff, shorter than nutlets; corolla minute, tubular or salverform; nutlets flat or convex and somewhat ovate or elongate, with the toothed or undulate margins usually armed with uncinate hairs.....16. *Pectocarya*.
Fruiting pedicels various, usually flexuous, much longer than nutlets; corolla conspicuous, subrotate or rotate-tubular; nutlets with cupulate margins which lack uncinate hairs or teeth.....17. *Omphalodes*.
Nutlets attached near base or middle, more or less erect and parallel, anterior face paralleling floral axis or forming a very narrow acute angle with it.
Fruiting calyces extraordinarily irregular, three lobes nearly distinct, the other more united, enclosing the fruit and becoming cornute with 7–9 long glochidiate processes; ovules 2. *Harpagonelleae*.....18. *Harpagonella*.
Fruiting calyces regular or practically so, not armed with cornute glochidiate processes; ovules usually 4. *Eritrichieae*.
Corolla-lobes convolute in the bud; herbs with usually ebracteate racemes and smooth narrowly and basally attached nutlets.....19. *Myosotis*.
Corolla-lobes imbricate in the bud.
Nutlets 2, each commonly 2-celled; anthers sagittate with the auricles usually appendaged; rather rank herbs with broad deeply cordate sessile leaves.....20. *Cerinthe*.
Nutlets usually 4, these normally 1-celled; anthers not sagittate nor appendaged; leaves not cordate.
Fruiting calyx strongly accrescent, very veiny, irregularly toothed and lobed, plicate.....21. *Asperugo*.
Fruiting calyx moderately accrescent if at all, not conspicuously veiny nor irregularly toothed or lobed, never plicate.
Cotyledons 2-lobed; corollas unappendaged, orange or yellow.....22. *Amsinckia*.

Cotyledons unlobed; corollas almost always appendaged, white or blue or very rarely even yellowish.
Shrub 9–18 dm. high; nutlets broadly attached anteriorly for nearly their whole length, margin lacerate, dorsum with glochidiate appendages.....23. *Selkirkia.*
Herbaceous or rarely suffrutescent plants, less than 9 dm. high.
Nutlets with a definite medial ventral groove formed by the non-fusion of the pericarpial walls.....24. *Cryptantha.*
25. *Oreocarya.*
Nutlets with the pericarpial walls fused at least above the middle and commonly forming a medial ventral keel.
Dorsum of nutlets not encircled by an up-turned rim or flange, almost always without glochidiate appendages.
Corolla white, throat very short and shallow, tube exceeded by or rarely just exceeding calyx; nutlets usually with a medial dorsal keel; style usually shorter than nutlets.....26. *Plagiobothrys.*
Corolla blue, throat cylindrical or funnelform, tube usually much surpassing calyx; nutlets usually lacking a medial dorsal keel; style usually greatly exceeding nutlets..27. *Mertensia.*
Dorsum of nutlets encircled by an up-turned rim or flange which is usually toothed or lacerate, commonly with uncinate hairs or glochidiate appendages.
Gynobase flat; nutlets definitely tetrahedral, attached basally (at apex of inverted tetrahedron) or through a suprabasal substipitate prolongation.....28. *Trigonotis.*
Gynobase pyramidal or subulate; nutlets not at all tetrahedral, attached ventrally.
Nutlets equalling the subulate gynobase, attached for nearly their whole length along the ventral keel, lacking a definite areola; style usually surpassing nutlets; bracteate annuals.....29. *Lappula.*
Nutlets twice surpassing the stout pyramidal gynobase, attached obliquely supramedially by a deltoid or ovate areola; style exceeded by nutlets; usually ebracteate; perennials or biennials.

Fruiting calyces erect or ascending; low densely caespitose silky-pubescent plants with small firm leaves.....30. *Eritrichium.*
Fruiting calyces reflexed; rank tufted glabrous or sparsely pubescent plants with broad herbaceous leaves.....31. *Hackelia.*

1. **Borago** [Tourn.] L. Sp. Pl. 137 (1753); Gen. Pl. 67 (1754).

Borago officinalis L. Sp. Pl. 137 (1753).—Native of the Mediterranean region. Introduced in N. S., Me.!, N. H.!, Mass.!, Conn., N. Y., Penn., D. C., Va., Ont., Tenn., Ill.!, O., Mich., Wis., N. D., Ore., B. C., Vera Cruz!, Jalisco, Nicaragua, Ecuador, Bolivia!, Chile, Uruguay, Argentina.

2. **Nonea** Medik. Phil. Bot. i. 31 (1789).

KEY TO SPECIES.

Nutlets apparently attached on side, longer than tall, with the strongly defined coarse annular basal rim papillose-dentate on margin.....1. *N. vesicaria*
Nutlets apparently attached at or near the base, evidently taller than broad, with the annular basal portion weakly developed and not papillose-dentate.
Nutlets brown, nearly vertical, only slightly oblique, subterete, very obscurely rugose, greatest breadth ca. ⅔ height; plant commonly branched only near base; corolla usually yellow.....2. *N. lutea.*
Nutlets plumbeous, strictly ascending, strongly oblique, compressed, conspicuously rugose, greatest breadth nearly equalling height; plant branched above; corolla rose-colored at least upon opening.....3. *N. rosea.*

1. **Nonea vesicaria** (L.) Reichenb. Fl. Germ. Excur. i. 338 (1831). *Lycopsis vesicaria* L. Sp. Pl. 138 (1753). *Echioides nigricans* Desf. Fl. Atl. i. 163 (1798–1800). *N. nigricans* DC. Fl. Fr. iii. 626 (1805).—Native of the western Mediterranean region. Reported, Mem. N. Y. Bot. Gard. v. 525 (1915), as adventive in the vicinity of New York.

2. **N. lutea** (Desr.) DC. Fl. Fr. iii. 626 (1805); Bornmüller, Bull. Herb. Boiss. ser. 2, vii. 780 (1907). *Lycopsis lutea* Desr. in Lam. Dict. iii. 657 (1791). *L. ciliata* Willd. Sp. Pl. i. 780 (1797). *N. ciliata* DC. l. c. *L. setosa* Lehm. Asperif. ii. 269 (1818). *N. setosa* R. & S. Syst. iv. 754 (1819).—Native of southeastern Europe and adjacent Asia. Occasionally introduced in impure seed. Known from Penn.!, Ky.!, and N. Y.!

3. **N. rosea** (Marschall) Link, Enum. i. 167 (1821). *Anchusa rosea* Marschall, Fl. Taur.-Cauc. i. 125 (1808).—Native of southeastern Europe. Collected in a waste place at Bangor, Me., in 1902 by O. W. Knight.

3. **Symphytum** [Tourn.] L. Sp. Pl. 136 (1753); Gen. Pl. 66 (1754).

Key to Species.

Stems and inflorescence covered with short recurved thornlet- or prickle-like hairs; tip of corolla-lobes erect.....1. *S. asperum*.
Stems and inflorescence glabrate or sometimes hirsute, but pubescence not recurved and prickle-like; tips of corolla-lobes recurved.
Leaves conspicuously decurrent; root branched, fusiform, without tuberous thickenings; nutlets lustrous, smooth, almost lacking the annular thickened base; base entire...2. *S. officinale*.
Leaves not decurrent or very obscurely so; root horizontal with tuberous thickenings; nutlets dull, finely tuberculate, with an annulate toothed base.....3. *S. tuberosum*.

1. **Symphytum asperum** Lepechin, Nov. Act. Acad. Petrop. xiv. 444, t. 7 (1805); Bucknall, Jour. Linn. Soc. xli. 510 (1913); Macbr. Rhodora xviii. 23 (1916). *S. asperrimum* Donn, Bot. Mag. xxiv. t. 929 (1806).—Native of the Caucasus region of southeastern Europe and adjacent Asia. Introduced in P. E. I.!, Que.!, N. S.!, N. B.!, Me.!, Vt.!, Conn.!, Mass.!, N. Y.!, Md., Mich.!, Wash.!, B. C.

2. **S. officinale** L. Sp. Pl. 136 (1753).—Native of temperate Europe. Introduced in Newf.!, Que., N. S.!, Me.!, N. H.!, Vt.!, Mass.!, R. I.!, Conn.!, N. Y.!, Md., Del., D. C., W. Va., Va.!, N. C.!, Tenn., Ky., O., Ont., Wis., Ind., Mich., Minn., Wis., Mo., Mont., La.

3. **S. tuberosum** L. Sp. Pl. 136 (1753).—Native of middle and southern Europe. Known in America only from Connecticut where reported from Southington! and Guilford.

4. **Lycopsis** L. Sp. Pl. 138 (1753); Gen. Pl. 68 (1754).

Lycopsis arvensis L. Sp. Pl. 139 (1753).—Native of temperate Europe. Introduced in Que.!, N. B.!, N. S., Me.!, Mass.!, R. I.!, N. Y.!, Penn.!, Va., D. C., O., Ont., Minn., Colo., Calif.!, Chile.

5. **Anchusa** L. Sp. Pl. 133 (1753); Gen. Pl. 64 (1754).

Key to Species.

Nutlets erect, oblongish, nearly twice as tall as thick; calyx cut to near base, 7–15 mm. long, lobes narrowly linear-acuminate; corolla with limb 12–20 mm. broad, appendages densely penicillate; bracts linear-lanceolate, simulating calyx-lobes.....1. *A. azurea*.
Nutlets horizontal, somewhat ovoid, less tall than long; calyx cut to near middle or below, 5–7 mm. long, lobes deltoid to lanceolate; corolla with limb 5–10 mm. broad, appendages entirely pubescent.

Nutlets 1.5 mm. high, 2.2 mm. long; calyx-lobes deltoid, evidently shorter than tube, tube frequently bladdery-inflated in advanced fruiting; bracts linear to narrowly lanceolate; cauline leaves 3–8 or exceptionally 13 mm. broad; inflorescence usually a cylindrical panicle; fruiting racemes 2–5 cm. long.....2. *A. capensis.*

Nutlets 2 mm. high, 3 mm. long; calyx-lobes lanceolate or narrowly triangular, about equalling tube, tube never bladdery-inflated; bracts ovate or oblong; cauline leaves 8–25 mm. broad; inflorescence various; fruiting racemes 6–12 cm. long.....3. *A. officinalis*

1. **Anchusa azurea** Mill. Gard. Dict. ed. 8, n. 9 (1768); Schinz & Thell. Vierteljahrs. Naturf. Ges. Zürich liii. 557 (1908). *A. italica* Retz. Obs. Bot. i. 12 (1779.) *A. paniculata* Aiton, Hort. Kew i. 177 (1789). *Buglossum elatum* Moench, Meth. 418 (1794).—Native of the Mediterranean region. Material from Granby, Conn., and Salem, Ore., has been examined. It has been reported, Rhodora xxv. 28 (1923), from East Boston.

2. **A. capensis** Thunb. Prodr. Pl. Cap. 34 (1794).—Native of South Africa. Occasionally cultivated; occurring as an escape at Salem, Ore.

3. **A. officinalis** L. Sp. Pl. 133 (1753). *A. angustifolia* L. l. c.; Schinz & Thell. Viertljahrs. Naturf. Ges. Zürich liii. 557 (1908). *A. officinalis*, var. *angustifolia* DC. Prodr. x. 43 (1846); Machr. Rhodora xviii. 51 (1916). *A. arvalis* Reichenb. Fl. Germ. Excur. 343 (1831).—Native of temperate Europe and of Asia Minor. Introduced in Me.!, Mass.!, R. I.!, Conn.!, N. Y., N. J.!, O., Ut., Colo., Argentina. Attempts have been made to distinguish the var. *angustifolia* among the immigrant plants of *A. officinalis.* The variety, however, seems too unimportant and vague to warrant its recognition among the introduced material. "*A. leptophylla* Roem. & Schult." is reported as a waif in the vicinity of New York by Taylor, Mem. N. Y. Bot. Gard. v. 525 (1915). The record may be based on a form of *A. officinalis* L. since Boissier, Fl. Orient. iv. 154 (1875), suggests that Roemer & Schultes's species may be only a narrow-leaved phase of *A. officinalis.*

6. **Echium** [Tourn.] L. Sp. Pl. 139 (1753); Gen. Pl. 68 (1754).

KEY TO SPECIES.

Basal leaves ovate or broadly oblong, secondary nervation manifest; upper leaves narrowed from a broad cordate subamplexicaul base; corolla of a delicate texture, glabrous or but sparsely setose.....1. *E. plantagineum.*

Basal leaves oblanceolate, secondary nervation obscure; upper leaves not cordate nor subamplexicaul; corolla of rather firm texture and usually pubescent as well as setose.

Stamens very unequal, a pair conspicuously exserted and a shorter one subincluded; plants with an obscured central axis, the long branches rebranched.....2. *E. Coincyanum.*
Stamens in two subequal exserted pairs; plants branched at base, central axis definite, with its laterals short and almost invariably unbranched.
Inflorescence a close narrow elongate thyrse 3–7 cm. thick; when present the slender spreading hairs on the herbage with inconspicuous or no pustulate bases.....3. *E. vulgare.*
Inflorescence a very loose broad thyrse 7–30 cm. thick; herbage usually with very conspicuous pustulate bases to the very coarse spreading hairs.....3a. *E. v. pustulatum.*

1. **Echium plantagineum** L. Mant. Alt. 202 (1771); Coincy, Jour. de Bot. xiv. 328 (1900); Lacaita, Jour. Linn. Soc. xliv. 420 (1919). *E. violaceum* of authors, not L. (1767); Coincy, l. c.; Lacaita, l. c. 423. *E. bonariensis* Poir. Encyc. viii. 674 (1808).—Native of the Mediterranean region and the Near East. At an early date introduced into South America where now widely distributed over the states of Buenos Aires and Entrerios in Argentina, over all of Uruguay, and over parts of extreme southern Brazil. In North America reported merely as adventive in the vicinity of New York City.

2. **E. Coincyanum** Lacaita, Jour. Linn. Soc. xliv. 374 (1819). *E. australe* of Coincy, Jour. de Bot. xiv. 326 (1900), and Rouy & Fouc. Fl. Fr. x. 309 (1908).—Native of the Spanish peninsula. Only two American collections have been seen, one made at Farmington, Me., in 1882 by Keyes, and the other made near Cambridge, Mass., in 1913 by Fernald & Long. The latter collection has the corollas merely setose and may not be correctly determined.

3. **E. vulgare** L. Sp. Pl. 139 (1753); Lacaita, Jour. Linn. Soc. xliv. 426 (1919).—Native of Europe. Long ago introduced into eastern United States and now a serious pest in the New England and Middle Atlantic states. Known from Que.!, N. S.!, N. B.!, Me.!, N. H.!, Vt.!, Mass.!, R. I.!, Conn.!, N. Y.!, N. J., Penn.!, Del., Md., Va.!, W. Va.!, D. C.!, N. C., Ga., Ont.!, O., Ind.!, Ill.!, Ky., Tenn., Wis., Mich., Iowa, Mo.!, Neb., S. D., Kan., La., Texas, N. M. Reported from Chile by Reiche, Fl. Chile v. 240 (1910).

3a. **E. vulgare**, var. **pustulatum** (Sibth. & Sm.) Coincy, Jour. de Bot. xiv. 301 and 303 (1900). *E. pustulatum* Sibth. & Sm. Fl. Graec. ii. 68, t. 180 (1813); Lacaita, Jour. Linn. Soc. xliv. 386 (1919).—Native of the Mediterranean region. Adventive in America and known only from N. J.!, Penn.!, D. C.?, and W. Va.! Old mutilated plants of the typical phase of *E. vulgare* frequently take on the loosely branched habit of this variety, but should not be confused with it

7. **Moritzia** DC. in Meisn. Genera i. 280; ii. 188 (1840).

Meratia A. DC. Prodr. x. 104 (1846).

KEY TO SPECIES.

Nutlets smooth; style 5–7 mm. long, greatly surpassing fruit as well as corolla; corolla-tube ca. 5 mm. long, clearly exceeding calyx; corolla-lobes oblong-deltoid; corolla-appendages ligulate, protruded; inflorescence shaggy-pubescent; calyces all sessile.....1. *M. ciliata.*

Nutlets muriculate; style 1–2 mm. long, surpassed by nutlets; corolla-tube ca. 2 mm. long, equalling or slightly exceeded by the calyx; corolla-lobes semicircular to short-ovate; corolla-appendages represented merely by circular bearded areas, not ligulate nor protruded; inflorescence short-strigose; lowermost calyces with pedicels.....2. *M. Lindenii.*

1. **Moritzia ciliata** (Cham.) DC. in Meisn. Genera ii. 188 (1840): Fresen. in Mart. Fl. Brasil. viii. pt. 1, 63, t. 10, fig. 13 (1857); Gürke in E. & P. Nat. Pflanzenf. iv. Abt. 3, 121, fig. 47l and 47m (1893). *Anchusa ciliata* Cham. Linnaea iv. 440 (1829). *M. ciliata*, var. *hirsuta* Fresen. l. c.—BRAZIL: Porto Alegre, *Reineck* (G); Prov. Rio Grande do Sul, 1897, *Reineck & Czermak 1* (US); without locality, *Sellow 672* (US, ISOTYPE of *A. ciliata* Cham.).—The species is known positively only from extreme southern Brazil.

2. **M. Lindenii** (A. DC.) Benth. acc. Gürke in E. & P. Nat. Pflanzenf. iv. Abt. 3, 121 (1897). *Meratia Lindenii* A. DC. Prodr. x. 104 (1846).—COLOMBIA: wet mossy paramo, Paramo de Cruz Verde, near Bogotá, alt. 3300–3500 m., *Pennell 2052* (US, NY, G); moist grassy paramo, alt. 3400–3700 m., Cerro Tatama, Dept. of Caldas, *Pennell 10576* (G); forest below Paramo del Quindio, alt. 3500–3800 m., Dept. of Caldas, *Pennell & Hazen 10078* (G). VENEZUELA: Paramo de la Sal, Mérida, 3400 m., *Jahn 515, 592* (US).—The type of this very distinct species is given as having come from Carácas, Venezuela. Although Gürke attributes the accepted combination to Bentham, the latter appears to have done no more than indicate in the Genera Plantarum, ii. 859 (1876), that *Meratia* was synonymous with *Moritzia.*

8. **Thaumatocaryon** Baill. Bull. Mens. Soc. Linn. Paris 839 (1890).

KEY TO SPECIES.

Leaves opposite throughout the plant; nutlets smooth and shiny.

Cauline leaves ovate or narrowly ovate-oval, base somewhat cordate.....1. *T. Hilarii.*

Cauline leaves lance-oblong to ovate-oblong, base rounded.

2. *T. tetraquetrum.*

Leaves alternate throughout the plant; nutlets (at least in no. 4) muricate and dull.
Anthers conspicuously exceeded by length of filaments; plants somewhat hispid, harsh to touch; lowermost leaves conspicuously developed, 10–15 cm. long, 25–45 mm. broad; corolla ca. 5 mm. long.....3. *T. dasyanthum*.
Anthers and filaments about equally long; plants evenly strigose, smoothish; lowermost leaves not well developed, 3–7 cm. long, 8–18 mm. broad; corolla ca. 4 mm. long.
4. *T. Sellowianum*.

1. **Thaumatocaryon Hilarii** Baill. Bull. Mens. Soc. Linn. Paris 839 (1890). *Antiphytum Bornmülleri* Pilger in Fedde, Repert. iii. 24 (1906). *A. Bornmülleri*, var. *asperior* Pilger, l. c. 25.—This species is known to me only through descriptions, and it is with much doubt that I accord it full recognition. According to Pilger, l. c., it differs from *T. tetraquetrum* in its broader leaves, thicker shorter inflorescence, and smaller calyx-lobes. The Saint-Hilaire and the Bornmüller material comes from Rio Grande do Sul, Brazil.

2. **T. tetraquetrum** (Cham.), comb. nov. *Anchusa tetraquetra* Cham. Linnaea viii. 113 (1833). *Antiphytum tetraquetrum* DC. Prodr. x. 122 (1846).—Brazil: without locality, *Sellow* (isotype, US). Paraguay: Alto Paraná, *Fiebrig 5885, 6131* (G, US); "Sierra de Maracayú," *Hassler 5231* (G).—All precisely labeled material comes from eastern Paraguay and seems to be exactly matched by isotypic material. It is not improbable that Sellow's original collection came from outside the present limits of Brazil. This species has been almost universally regarded as a member of *Antiphytum*, being so treated in my recent revision of that genus, Contr. Gray Herb. n. s. lxviii. 51 (1923). The species, however, is a rank-growing broad-leaved herb with a tubular calyx that permanently encloses the single nutlet matured. These developments are not known in the other species of *Antiphytum*, but they do occur in and characterize *Moritzia* and *Thaumatocaryon*. It is hence with considerable confidence that I now transfer the species from *Antiphytum*.

3. **T. dasyanthum** (Cham.), comb. nov. *Anchusa dasyantha* Cham. Linnaea iv. 437 (1829). *Moritzia dasyantha* Fresen. in Mart. Fl. Brasil. viii. pt. 1, 63 (1857).—Brazil: without locality, *Sellow 7964* (isotype, US).—A mature collection of this species is greatly needed, as the only available material is a duplicate of the original collection and like it lacks fruit. Until mature fruit is available the status of the species is somewhat problematic. It seems most nearly related to *T. Sellowianum*, but is a coarser plant with longer pubescence and larger corollas.

4. **T. Sellowianum** (Cham.), comb. nov. *Anchusa Sellowiana* Cham. Linnaea iii. 115 (1833). *Moritzia Sellowiana* Fresen. in Mart. Fl. Brasil. viii. pt. 1, 63, fig. 14 (1851).—Brazil: without locality, *Sellow* (isotype, US).

9. **Macromeria** Don, Edinb. New Philos. Jour. xiii. 239 (1832).

Philonomia DC. in Steud. Nom. ed. 2, ii. 320 (1841).

Key to Species.

Corolla with lobes reflexed or recurved at least during pollination, evidently irregular, limb oblique, throat somewhat distorted abaxially in the bud. § *Eumacromeria*.
- Filaments 3–6 cm. long, about twice length of corolla-lobes, excessively exserted and conspicuous; corolla very large, 7–8 cm. long; lower leaves obovate; anthers linear-arcuate, 3–3.5 mm. long. . . . . 1. *M. exserta*.
- Filaments ca. 1 cm. long, about equalling or a trifle exceeding corolla-lobes, not strikingly and conspicuously exserted; corolla medium-sized, 4–5.5 cm. long; lower leaves lanceolate; anthers straight, oblong, 2–2.5 mm. long. . . . . 2. *M. hispida*.

Corolla with lobes erect or ascending and never reflexed or recurved, practically regular, limb not oblique and throat without any abaxial distortion. § *Macromerioides*.
- Stems conspicuously hirsute; anthers linear 3–4 mm. long, attached between the base and middle, usually erect. . . 3. *M. longiflora*.
- Stems closely short-strigose; anthers oblong or linear-oblong, 2–3 mm. long, attached just below the middle, subversatile.
  - Upper surface of leaves merely scabrous, without hairs or pustules. . . . . 4. *M. discolor*.
  - Upper surface of leaves not only scabrous but also strigose or somewhat pustulate.
    - Corolla 4–4.5 mm. long, appressed silky-villous outside; Mexican. . . . . 5. *M. Pringlei*.
    - Corolla ca. 2.5 mm. long, tomentose outside; Peruvian. 6. *M. cinerascens*.

1. **Macromeria exserta** Don, Edinb. New Philos. Jour. xiii. 239 (1832); Bot. Reg. xxxiii. t. 26 (1847). *Echium longiflorum* Sesse & Moc. Pl. N. Hisp. 20 (1887).—Mountainous portions of southwestern Mexico from Jalisco to Oaxaca. Most abundant on the Pacific slope of Oaxaca or at least most collected there. This species is readily distinguished by its very coarse habit, obovate lower leaves, and its very large showy somewhat irregular corollas with enormously exserted stamens. Its corollas are the largest in the family. The plants are usually abundantly shaggy-hirsute on the stems, but in *M. exserta*, var. *imparata* Macbr., Contr. Gray Herb. n. s. xlix. 22 (1917), the stems are closely short-strigose.

2. **M. hispida** Mart. & Gal. Bull. Acad. Brux. xi. 339 (1844). *M. longiflora*, var. *hispida* A. DC. Prodr. x. 68 (1846). *Onosmodium*

longiflorum, var. *hispidum* Macbr. Contr. Gray Herb. n. s. xlix. 21 (1917). *M. longiflora* of A. DC. l. c., not of Don (1832).—Known only from Michoacan.

3. **M. longiflora** (Sesse & Moc.) Don, Edinb. New Philos. Jour. xiii. 239 (1832). *Lithospermum longiflorum* Sesse & Moc. Fl. Mex. 29 (1894). *Onosmodium longiflorum* Macbr. Contr. Gray Herb. n. s. xlix. 21 (1917). *M. viridiflora* DC. Prodr. x. 68 (1846); Moc. & Sesse, Calq. Fl. Mex. t. 904 (1874). *O. Thurberi* Gray, Synop. Fl. N. Am. ii. pt. 1, 205 (1878). *M. Thurberi* Mack. Bull. Torr. Bot. Cl. xxxii. 496 (1905).—Middle and southern New Mexico and Arizona, southward into Chihuahua and Sonora. *Macromeria viridiflora* DC. is based upon a Sesse & Mociño plate which evidently pictures the species which Gray called *O. Thurberi*, the drawing and Gray's type agreeing in possessing such distinctive characters as spreading pubescence on leaves and stems, leaves with numerous veins, very pubescent corollas with erect greenish lobes, and stamens that just equal or barely surpass the corolla-tube. *Macromeria longiflora* Don, was based upon "*Lithospermum longiflorum*, Sesse et Mocino, mss. in herb. Lamb." The description of *L. longiflorum* by Mociño & Sesse, Fl. Mex. 29, applies to the plant figured in their plates, and their species is hence a synonym of *M. viridiflora* DC. *Macromeria longiflora* Don was based upon material labeled by Mociño & Sesse, but the exceedingly short description written by Don gives the leaves as "smoothish" whereas in *M. Thurberi* and in the Mociño & Sesse plates they are notably rough. There is, hence, a possibility that Don's plant is different from the one described and figured by Mociño & Sesse In their flora the latter authors give the type locality of *L. longiflorum* as "ad oppidum S. Rosae prope Guanaxuatum." This station could scarcely be within the present state of Guanajuato since the plant they illustrate and describe belongs to a northern species not known south of the southern boundary of Chihuahua. I suspect that the type was collected in southeastern Sonora where they are known to have collected within the range of the species treated.

4. **M. discolor** Benth. Pl. Hartw. 49 (1840). *Onosmodium discolor* Macbr. Contr. Gray Herb. n. s. xlix. 20 (1917).—Southern Jalisco southward into Oaxaca. Readily recognized by its glabrous, yet scabrous, upper leaf-surfaces which dry a rich chocolate brown.

5. **M. Pringlei** Greenm. Proc. Am. Acad. xxxiv. 570 (1899). *Onosmodium Pringlei* Macbr. Contr. Gray Herb. n. s. xlix. 20 (1917).—Known only from the Sierra Pachuca in Hidalgo.

5. **M. cinerascens** A. DC. Prodr. x. 69 (1846).—Known to me only from descriptions and perhaps improperly referred to *Macromeria*. The type came from Chachapoyas, Peru.

10. **Lasiarrhenum**, gen. nov.

Calyx 5-partitus, segmentis linearibus. Corolla tubulosa, recta, fauce nuda; lobi 5, erecti, breves, rotundi vel obtusi. Stamina 5, conniventia, tubo affixa, inclusa, filamentis brevibus ligulatis; antherae compresse fusiformes, dorso hirsutissimae, loculis subdistinctis, connectivo conspicue producto acuminato. Ovarii lobi 4, distincti, erecti, subglobosi, gynobasi planae impositi. Stylus filiformis, tarde (non praecociter) exsertus; stigmatibus 2 cohaerentibus parvis. Nuculae 1–4, erectae, nitidae, albae, areola plana gynobasi planae affixae. Semina recta, cotyledones planae.—Herbae mexicanae erectae perennes rudes hirsutae et scabrae. Folia alterna, venis primariis valde elevatis. Racemi terminalis rami scorpioidei bracteati primum densi deinde elongati dissitiflori. Flores pedicellati albi vel incarnati. (Name from λάσιος, *hairy*, and ἄρρην, *male*, with reference to the hirsute anthers.)

Lasiarrhenum strigosum (HBK.), comb. nov. *Onosma strigosum* HBK. Nov. Gen. et Sp. iii. 93 (1818). *Onosmodium strigosum* Don, Gen. Syst. iv. 317 (1837). *Onosma trinervium* Lehm. Asperif. ii. 378 (1818); Icones i. 11, t. 9 (1821). *Lithospermum longifolium* Willd. in R. & S. Syst. iv. 742 (1819).—Pacific slope of southern Mexico from Jalisco to Oaxaca.

This species has been usually taken as a member of the genus *Onosmodium*, but its reference there destroys the homogeneity of that genus and leaves the latter almost characterless, whereas its removal as a distinct genus allows *Onosmodium* and all its immediate relatives to be sharply and very naturally defined. As an alternative to the above proposal, the genera *Onosmodium* and *Macromeria* might be submerged in *Lithospermum*. This latter proposal seems quite unwise, however, since it would bring under a single genus a great diversity of corolla-structures, thereby setting a new and much lower value upon them in the classification of the tribe *Lithospermeae* and causing far reaching readjustments among the very numerous Old World members of the alliance.

The genus *Lasiarrhenum* is most nearly allied to *Onosmodium*, that genus being taken as defined by Mackenzie, Bull. Torr. Bot. Cl. xxxii. 495–6 (1905). *Lasiarrhenum* agrees with its relative in having sagittate anthers and cylindrical corollas with erect lobes, but differs

in having rounded corolla-lobes, ligulate filaments, large hirsute anthers, and shortly and tardily protruded styles. *Onosmodium* is a very natural genus characterized by its tubular corolla with erect acute or acuminate lobes, short narrow filaments, narrowly sagittate glabrous anthers, and precociously long protruded style that is exserted before the corolla is even a third open.

Macbride, Contr. Gray Herb. n. s. xlix. 19–21 (1917), has recently amplified *Onosmodium* so as to include in it the majority of the species usually referred to *Macromeria* and restricted the latter genus to *M. exserta*. With this arrangement I am unable to agree, since it destroys the homogeneity of *Onosmodium* and obscures its characters, and since it separates generically such obviously related species as *M. exserta* and *M. hispida* because of fruit-characters of very dubious phylogenetic significance. *Macromeria*, as defined by De Candolle, Prodr. x. 68–9 (1846), is a very satisfactory and natural genus characterized by its exceptionally large usually trumpet-shaped occasionally irregular corollas with ascending or recurved ovate or oblongish usually acute lobes, very long filiform filaments that just exceed or very conspicuously surpass the throat of the corolla, oblong obtuse anthers, and tardily protruded style. The genus has the acute corolla-lobes of *Onosmodium*, but that is the only character which suggests a relation with the latter genus rather than with *Lithospermum*, the genus which seems to be its closest relation. *Onosmodium* differs from *Lithospermum* in its protruded stamens and large corollas with acutish lobes. *Lasiarrhenum* differs from *Macromeria* in its smaller cylindrical corollas with erect rounded lobes, ligulate included filaments, and sagittate hirsute anthers.

Lithospermum is a large and variable genus characterized by its ascending or divergent or recurved rounded or obtuse corolla-lobes, oblong included anthers, and style that is tardily and but little if at all exserted. It is also to be recognized by the frequent occurrence in its species of veinless leaves and obviously geminate styles, the species of *Macromeria*, *Onosmodium*, and *Lasiarrhenum* always having prominently veined leaves and obscurely geminate styles. In *Lithospermum* the corolla is extremely variable in size and form, though constant in the position and shape of its lobes. Faucal appendages have various developments, and among the species of Lithosperms all stages can be found between conspicuous intruded ligulate structures and mere downy spots or naked fauces. The genus is readily separated from *Lasiarrhenum* by its non-erect corolla-lobes, oblong glabrous anthers, and slender filiform filaments.

11. **Onosmodium** Michx. Fl. Bor. Am. i. 132 (1803).

Osmodium Raf. Med. Repos. N. Y. v. 350 or 352 (1808); Am. Mo. Mag. ii. 176 (1818); Am. Mo. Mag. iv. 191 (1819). *Purshia* Spreng. Anleit. ed. 2, ii. 450 (1817). *Onosmidium* Walp. Ann. iii. 134 (1853).

KEY TO SPECIES.

Corolla a clear light- or orange-yellow; lobes narrowly lanceolate-acuminate, 2–3 times as long as broad.....1. *O. virginianum.*
Corolla sordid or greenish-white or merely yellowish; lobes triangular-acute or -acuminate, little longer than wide.
  Corolla lobes more or less acuminate.
    Fruiting pedicels well developed, 8–15 mm. long; bracts ovate, obtusish; corolla-lobes about as long as tube, 8–10 mm. long.....2. *O. Helleri.*
    Fruiting pedicels not greatly elongated, 1–8 mm. long; bracts lanceolate or ovate-lanceolate, acute; corolla-lobes about half as long as tube.
      Stems conspicuously long spreading hirsute; corolla-lobes glabrate or pubescent down the middle; Texan..3. *O. bejariense.*
      Stems short appressed villous; corolla-lobes pubescent over most of outer surface; Mexican.....4. *O. unicum.*
  Corolla lobes merely acute.
    Stems smooth glabrous and usually shiny below.....5. *O. subsetosum.*
    Stems roughly pubescent and dull throughout.
      Nutlets strongly constricted at the base; plant always coarsely spreading hirsute.....6. *O. hispidissimum.*
      Nutlets with base rounded or if weakly constricted the plant somewhat silky hirsute.....7. *O. molle.*

1. **Onosmodium virginianum** (L.) A. DC. Prodr. x. 70 (1846). *Lithospermum virginianum* L. Sp. Pl. 132 (1753). *O. hispidum* Michx. Fl. Bor. Am. i. 133 (1803). *Purshia hispida* Lehm. Asperif. ii. 382 (1818). *O. scabrum* R. & S. Syst. iv. 57 (1819). *P. scabra* Nutt. Trans. Am. Philos. Soc. v. 189 (1837). (?) *O. nigrum* Raf. Atl. Jour. i. 148 (1832). *O. virginianum*, var. *hirsutum* Mack. Bull. Torr. Bot. Cl. xxxii. 499 (1905).—Connecticut to Florida, and westward along the Gulf to Louisiana. The southern material is frequently spreading hirsute and has been called the variety *hirsutum*.

2. **O. Helleri** Small, Fl. Southeast. U. S. 1000 (1903); Mack. Bull. Torr. Bot. Cl. xxxii. 497 (1905); Schulz, Wild Fl. San Antonio 176 (1922).—Known only from Texas. I have seen no flowers of this species, the floral characters used in the key having been derived from Schulz's, l. c., account of the species.

3. **O. bejariense** DC. Prodr. x. 70 (1846); Mack. Bull. Torr. Bot. Cl. xxxii. 505 (1905).—Known only from Texas.

4. **O. unicum** Macbr. Contr. Gray Herb. n. s. xlix. 21 (1917).—Known to me only from the type collection made at Alvarez, San Luis

Potosi. The plant is scarcely more than a pubescent geographic form of *O. bejariense* and perhaps does not merit specific rank.

5. **O. subsetosum** Mack. & Bush in Small, Fl. Southeast. U. S. 1001 (1903); Mack. Bull. Torr. Bot. Cl. xxxii. 505 (1905).—Missouri and Arkansas.

6. **O. hispidissimum** Mack. Bull. Torr. Bot. Cl. xxxii. 500 (1905). *O. hispidissimum*, var. *macrospermum* Mack. l. c. 502.—New York to Maryland, and westward to Louisiana, Texas, and Nebraska.

7. **O. molle** Michx. Fl. Am. Bor. i. 133, t. 15 (1803); Mack. Bull. Torr. Bot. Cl. xxxii. 499 (1905). *Lithospermum molle* Muhl. Cat. 19 (1813). *Purshia mollis* Lehm. Asperif. ii. 383 (1818). *O. cariolinianum*, var. *molle* Gray, Synop. Fl. N. A. ii, pt. 1, 206 (1878).—In its extreme form known only from the vicinity of Nashville, Tenn.

7a. **O. molle**, var. **occidentale** (Mack.), comb. nov. *O. occidentale* Mack. Bull. Torr. Bot. Cl. xxxii. 502 (1905). *O. occidentale*, var. *sylvestre* Mack. l. c. 504.—Minnesota and Illinois, westward to Texas, New Mexico, Utah, and Saskatchewan. This is the common *Onosmodium* west of the Mississippi River. The plant is not accorded specific rank due to the material from Illinois which shows repeated tendencies to intergrade with *O. molle*. The variety usually differs from the typical form of the species in its coarser stems, rough spreading pubescence, larger calyces (8–12 mm. long), and unpitted non-constricted nutlets, but these characters and their complements occur in various combinations in the collections from Illinois.

12. **Lithospermum** L. Sp. Pl. 132 (1753); Gen. Pl. 64 (1754).

Batschia Gmel. Syst. ii. 315 (1791). *Cyphorima* Raf. Jour. Phys. lxxxix. 98 (1819); Am. Mo. Mag. iv. 191 and 357 (1819). *Pentalophus* A. DC. Prodr. x. 86 (1846).

KEY TO SPECIES.

Plant evidently annual.
- Nutlets dull, densely tuberculate; calyx not cut to base.....1. *L. arvense.*
- Nutlets glossy, not tuberculate; calyx divided.
  - Leaves obtuse; fruiting calyx 3–5 mm. long; corolla 4–5 mm. long, tube ca. 2 mm. long; nutlets pitted.....2. *L. matamorense.*
  - Leaves acute; fruiting calyx 8–11 mm. long; corolla ca. 7 mm. long, tube ca. 5 mm. long; nutlets smooth....3. *L. Pringlei.*

Plants perennial or rarely biennial.
- Corolla definitely strigose inside.
  - Middle cauline leaves veinless, usually rounded or obtuse, commonly broadest above the middle, two surfaces weakly contrasted, both more or less sparsely strigose and the lower somewhat glaucous as well; basal leaves in a rosette; corolla yellow.....4. *L. lasiosiphon.*

Middle cauline leaves evidently veined, acute, broadest at or below the middle, two surfaces strongly contrasted, the upper green and glabrous, the lower canescent and densely strigose or tomentose; basal leaves not persistent at anthesis; corolla white.
Plant somewhat suffrutescent, very loosely branched; leaves thick, veins deeply impressed on upper surface; middle cauline leaves 1–2 cm. broad.....5. *L. discolor.*
Plants herbaceous, a little branched above; leaves not noticeably thick, veining not impressed on upper surface; middle cauline leaves 1.5–2.5 cm. broad..6. *L. hypoleucum.*
Corolla glabrate inside or merely with a hirsute ring at base.
Corolla definitely white.
Tube 12–14 mm. long, limb 10–16 mm. broad.....7. *L. Nelsonii.*
Tube 2–8 mm. long, limb 5–12 mm. broad.
Calyx-lobes ovate or oblong, not exceeding nutlets; plants low, decumbent or ascending, with a compact woody caudex; high altitudes in Peru..8. *L. peruvianum.*
Calyx-lobes linear, surpassing the nutlets; plants erect or ascending, lacking an evident compact woody caudex; middle altitudes in eastern Mexico..9. *L. distichum.*
Corolla yellow or yellowish.
Nutlets rugose-tuberculate.....10. *L. mirabile.*
Nutlets smooth or merely pitted
Corolla salverform, limb 9–18 mm. broad, lobes commonly fimbriate, tube slender, elongate, 15–33 mm. long, 1–3 mm. thick; later flowers cleistogamous, abundantly fructiferous, in fruit usually with recurved pedicels.....11. *L. angustifolium.*
Corolla various but if slenderly elongate-salverform the limb 2–7 mm. broad and lobes never fimbriate; flowers never cleistogamous; fruiting pedicels (except in no. 32) always erect.
Basal leaves persistent and forming a rosette at anthesis.
Plant with a short main root and numerous tuberous-thickened rootlets; cauline leaves ovate to obovate-oblong, 1–2 cm. broad; corolla 3–4 mm. broad, lobes erect.....12. *L. tuberosum.*
Plant with a scarcely branched tap-root; cauline leaves somewhat linear, 2–5 mm. broad; corolla 9–18 mm. broad, lobes spreading.
Radical leaves linear to oblanceolate, 8–13 mm. broad.....13. *L. cobrense.*
Radical leaves obovate, 15–23 mm. broad...14. *L. obovatum.*
Basal leaves lacking at anthesis.
Corolla inconspicuous, 4 mm. long or less or with tube clearly not exceeding the length of calyx-lobes.
Leaves herbaceous, veining evident.
Leaves 20–45 mm. broad, ovate-lanceolate; nutlets 28–35 mm. long; pubescence closely appressed.....15. *L. latifolium.*
Leaves 6–15 (–23) mm. broad, lanceolate; nutlets 20–28 mm. long; pubescence loosely appressed or somewhat spreading
16. *L. officinale.*

Leaves firm, apparently veinless.
Flowers in a very leafy cylindrical thryse, scattered along rather numerous short spreading branches.....27. *L. ruderale.*
Flowers racemose or disposed along several corymbose branches; inflorescence not conspicuously leafy.
Fruiting calyx short, lobes about twice length of nutlets.....17. *L. calcicola.*
Fruiting calyx long, lobes 3–5 times length of nutlets.
Bracts ovate or ovate-lanceolate; corolla 9–13 mm. long.....18. *L. revolutum.*
Bracts linear or oblong-linear; corolla 3–4 mm. long.....19. *L. obtusifolium.*
Corolla medium-sized or large, tube clearly exceeding calyx.
Leaves narrowly linear, 1–3.5 mm. broad, much reduced and inconspicuous in inflorescence; tap-root strongly fusiform-thickened; nutlets somewhat compressed, sharply keeled..20. *L. strictum.*
Leaves (principal ones) 5–30 mm. broad, usually conspicuous in the inflorescence; root not at all thickened; nutlets terete and not obviously keeled.
Leaves with evident veining.
Leaves glaucescent, concolorous; corolla unappendaged.....32. *L. californicum.*
Leaves green, not glaucescent at least above, usually somewhat bicolored; corolla with faucal appendages.
Corolla at most only 1 cm. long, tube cylindrical, lobes divergent, leaves 4–10 mm. broad.
Stems spreading-hirsute, light-colored, usually branched; calyx hirsute...21. *L. Seleri.*
Stems strigose, brownish, usually simple below inflorescence; calyx strigose.....22. *L. medial·.*
Corolla 12–27 mm. long; leaves 4–25 mm. broad.
Corolla gradually dilated, throat with twice diameter of tube-base, lobes usually ascending; stems sparsely but coarsely hirsute.
Cauline leaves linear or lance-linear, 4–8 mm. broad.....23. *L. guatemalense.*
Cauline leaves oblong, 10–25 mm. broad.....24. *L. oblongifolium.*
Corolla almost perfectly cylindrical, lobes usually recurved; stems rather densely short-hirsute or strigose.
Plant green; leaves scabrous above..25. *L. Palmeri.*
Plant canescent; leaves velutinous above.....26. *L. viride.*

Leaves apparently veinless.
Flowers in a very leafy cylindrical thryse, disposed along rather numerous short spreading branches; corollas greenish or pale yellow, usually less than 1 cm. long, more or less obscured by the foliaceous lanceolate bracts.....27. *L. ruderale.*
Flowers simply racemose or distributed along several elongating ascending corymbosely disposed branches; corolla not noticeably obscured by the small or reduced bracts.
Corolla cylindrical, lacking a differentiated throat, lobes divergent, breadth of limb not exceeding length of tube.
Calyx-lobes twice length of nutlets..28. *L. calycosum.*
Calyx-lobes about half longer than nutlets.
Stems spreading-hirsute.....17a. *L. c. Conzattii.*
Stems strigose.....22. *L. mediale.*
Corolla narrowly funnelform with a dilated throat and ascending lobes or if doubtfully so then with the breadth of limb equalling or exceeding the length of tube.
Later floral leaves reduced, scarcely if at all exceeding the calyx-lobes, somewhat simulating the latter.
29. *L. multiflorum.*
Later floral leaves surpassing the calyx-lobes and not simulating the latter.
Young parts silky-strigose; nutlets 2–3 mm. long; calyx-lobes 5–6 mm. long.....30. *L. canescens.*
Young parts of plant usually coarsely strigose; nutlets 3–4 mm. long; calyx-lobes 6–13 mm. long.
Herbage green; corolla 10–23 mm. broad, lobes spreading; calyx erect in fruit; Atlantic drainage.....31. *L. caroliniense.*
Herbage glaucescent; corolla 4–8 mm. broad, lobes ascending; calyx frequently recurved in fruit; Pacific drainage..32. *L. californicum.*

1. **Lithospermum arvense** L. Sp. Pl. 132 (1753).—Native of Europe and adjacent Asia and Africa. Introduced in Me.!, N. H.!, Vt.!, Mass.!, R. I.!, Conn.!, N. Y.!, N. J.!, Penn.!, Del.!, Md.!, D. C., Va.!, W. Va., N. C.!, S. C.!, Ga., Fla., Ont.!, Mich.!, Ohio, Ind., Ky., Tenn., Miss., Ala., Wis., Minn., Iowa, Mo.!, Ark., La., Neb., Kan.!, Mont.!, Utah, Calif., B. C.

2. **L. matamorense** A. DC. Prodr. x. 76 (1846). *L. prostratum*

Buckley, Proc. Acad. Philad. 1861, 462 (1861).—Central Texas southward into Nuevo Leon and Tamaulipas.

3. **L. Pringlei**, sp. nov., annuum 4–6 dm. altum rigidiusculum; caulibus paucis simplicibus vel laxe ascendenterque ramosis strigosis et hirsutis foliosis; foliis nervosis asperis hirsuto-strigosis saepe acutis infra pallidis, inferioribus ante anthesis torrentibus oblanceolatis, superioribus late lanceolatis brevissime petiolatis paullo reductis; racemis simplicibus vel rare furcatis foliosissimis statu fructifero conspicue dissitifloris ad 1–2 dm. longis; corollis flavis 8–10 mm. longis, tubo cylindrato 1.5–2 mm. crasso extus pubescenti calycem aequanti vel paullo superanti, lobis laxe ascendentibus vel (?) divergentibus ca. 1.5 mm. longis, faucibus appendices 5 orbiculares granuloso-pubescentes gerentibus; staminibus inclusis, antheris oblongis longitudine filamenta aequantibus; pedicellis 4–5 mm. longis strictis; calycibus fructiferis lineari-lobatis 8–10 mm. longis; nuculis saepe 4 ca. 2.5–3 mm. longis teretibus.—Mexico: Pedigral, Valley of Mexico, Federal District, 2250 m. alt., *Pringle 6416;* rocky hills near Metepec Station, Hidalgo, 2500 m. alt., June 25, 1904, *Pringle 12123* (type, Gray Herb.).—This very distinct species has been confused with *L. distichum* Ort., though not very closely related to it. In gross habit the new species much suggests *L. latifolium* Michx. and *L. officinale* L., but these species are perennial and have strong taproots. *Lithospermum latifolium* differs further by having broader leaves and more closely appressed strigose pubescence. The European *L. officinale* has thicker leaves, smaller corollas, smaller somewhat deciduous calyx-lobes, and smaller and fewer nutlets.

4. **L. lasiosiphon**, sp. nov., perenne laxe strigosum; caulibus erectis herbaceis 3–6 dm. altis foliosis; foliis obtusis vel rotundatis herbaceis supra viridibus infra glaucescentibus, inferioribus spathulatis 2.5–7 cm. longis 8–14 mm. latis laxe rosulatis paullo obscureque nervosis, superioribus oblanceolatis vel linearibus strictis numerosis gradatim reductis enerviis; racemis geminatis terminalibus strictis ad 15 cm. longis dissitifloris, bracteis linearibus vel lanceo-linearibus saepe calycem superantibus; pedicellis strictis longitudine calycem aequantibus vel vix brevioribus; calycibus fructiferis 5–7 mm. longis ad basin 5-partitis, lobis herbaceis linearibus vel lanceolatis; corollis infundibuliformibus 13–17 mm. longis dilute luteis extus breviter villosis intus sparse villosis lobis laxe ascendentibus limbus 8–10 mm. latis faucibus exappendiculatis; staminibus inclusis, filamentis quam antherae brevioribus; nuculis lucidis ca. 2.5 mm. longis laevibus.—Mexico: at 2250 m. alt. in the Sierra Madre near Colonia Garcia,

Chihuahua, Aug. 10, 1899, *Townsend & Barber 248* (TYPE, Gray Herb.).—In inflorescence and in the shape of its flowers *L. lasiosiphon* strongly suggests *L. multiflorum* Torr., but differs in having persistent basal foliage, less pubescent non-acute leaves that are broadest above rather than below the middle, and corollas that are pubescent inside. The new species is probably most related to *L. cobrense* Greene, but differs from that species in its funnel-formed internally pubescent corollas, and larger and broader not abruptly reduced non-involute leaves. The species is a very distinct one.

5. **L. discolor** Mart. & Gal. Bull. Acad. Brux. xi. 337 (1844). *L. chersinum* Macbr. Contr. Gray Herb. n. s. xlix. 22 (1917). *L. discolor*, var. *candicans* Kuntze, Rev. Gen. ii. 439 (1891).—Pacific slope of southwestern Mexico from Oaxaca to Tepic. Due to its branching habit and very thick decidedly bicolored leaves this is an exceptionally well marked species.

6. **L. hypoleucum**, sp. nov., perenne herbaceum ca. 7 dm. altum; caulibus erectis simplicibus vel apicem versus breviter ramosis dense retrorseque pubescentibus et hirsutis; foliis subsessilibus acutis obovato-oblongis vel oblongo-ovatis 5–7 cm. longis 2–2.5 cm. latis conspicue nervosis, supra viridibus scabris, subtus albidis vel canescentibus dense tomentosis; racemis terminalibus furcatis; calycibus fructiferis ca. 1 cm. longis, lobis linearibus, pedicellis crassis ca. 2 mm. longis bracteas saepe (?) aequantibus vel superantibus; corollis ca. 12 mm. longis (ut videtur albescentibus); tubo cylindrato 2.5–3 mm. crasso calycem 1–2 mm. superante intus medium versus villoso, lobis ascendentibus ca. 2.5 mm. longis, faucibus exappendiculatis; staminibus ad basin tubi adfixis; filamentis brevibus; nuculis ignotis.—MEXICO: Loma St. Maria near Morelia, Michoacan, 1850 m. alt. July 29, 1909, *Arsène 2511* (TYPE, Gray Herb.).—A very well marked species probably most nearly related to *L. discolor* Mart. & Gal. It agrees with its relative in having white or whitish corollas that are pubescent inside, and by having conspicuously bicolored leaves that are tomentose beneath. It differs in having simple coarser herbaceous stems, larger much less firm leaves, tubular rather than funnelform corollas, and longer calyx-lobes. The type was distributed as *Onosmodium bejariense* DC.

7. **L. Nelsonii** Greenm. Proc. Am. Acad. xl. 31 (1904).—Known only from the vicinity of Monterey, Nuevo Leon, and very distinct in its large white salverform corollas, though nevertheless an evident relative of *L. distichum* Ort.

8. **L. peruvianum** A. DC. Prodr. x. 77 (1846). *L. andinum*

Krause, Engler Bot. Jahrb. xxxvii. 636 (1906).—Peruvian Andes at altitudes over 3000 m. The DeCandollean material came from Chachapoyas in northern Peru, and that of Krause from Tarma in central Peru. I have seen a collection from Puno in southern Peru. *Lithospermum incanum* R. & P., Fl. Peruv. ii. 4 (1799), not Forst. (1788), the type of which came from arid hills near Tarma, may be found synonymous with *L. peruvianum*. It was described as an herbaceous annual with a fusiform fibrous tap-root, but may have been based on young plants.

9. **L. distichum** Ortega, Hort. Matr. Dec., i. 8 (1797). *Batschia disticha* Don, Gen. Syst. iv. 326 (1838). *L. spathulatum* Mart. & Gal. Bull. Acad. Brux. xi. 337 (1844). *Anchusa mexicana* Sesse & Moc. Pl. Nov. Hisp. 21 (1887). *L. laevigatum* Sesse & Moc. Fl. Mex. 30 (1894). (?) *L. discolor*, var. *subviride* Kuntze, Rev. Gen. ii. 439 (1891).—Southern San Luis Potosi southward to Chiapas. Originally described from garden plants grown from seed said to have come from Cuba. The seeds probably came from Mexico, since only Mexican plants agree with the original description and with Jacquin's plate, Frag. Bot. 42, t. 48, fig. 3 (1809), and since Dr. N. L. Britton writes me that no native *Lithospermum* is known either from Cuba or from any other of the West Indian islands.

10. **L. mirabile** Small, Fl. Southeast. U. S. 999 and 1337 (1903); Schulz, Wild Fl. San Antonio 176 (1922).—Known only from the vicinity of San Antonio, Texas. I doubtfully associate with Small's species a plant in the Gray Herbarium collected by Palmer in Sept. 1880 at Soledad, Coahuila. The specimen mentioned has nutlets as coarsely roughened as those on isotypic material of *L. mirabile*, but has nutlets lacking the conspicuous angular margins of the authentic material. The specimen is further atypical in having a funnel-form corolla about as long as the calyx, rather than one much exceeding the calyx. The plant from about San Antonio has a characteristic aspect, a fact which, coupled with its peculiar angled and roughened nutlets, seems to make it desirable for the present, at least, to consider the species as one of restricted range, although very close to and somewhat doubtfully distinct from *L. angustifolium* Michx.

11. **L. angustifolium** Michx. Fl. Bor. Am. i. 130 (1803). *Cyphorima angustifolia* Nieuwl. Am. Midland Nat. iii. 194 (1914). *L. fimbriatum* Nutt. in Fras. Cat. no. 11 (1813), nom. nud. *Batschia longiflora* Nutt. in Pursh, Fl. Sept. Am. i. 132 (1814); Nutt. Gen. i. 114 (1818). *L. longiflorum* Spreng. Syst. i. 544 (1825). *Pentalophus longiflorus* A. DC. Prodr. x. 86 (1846). *C. longiflora* Raf. in Hook. f. & Jacks.

Ind. Kew. i. 701 (1893). *B. decumbens* Nutt. Gen. i. 114 (1818). *L. decumbens* Torr. Ann. Lyceum N. Y. ii. 225 (1826). *C. decumbens* Raf. in Hook. f. & Jacks. Ind. Kew. i. 701 (1893). *L. incisum* Lehm. Asperif. ii. 303 (1818). *L. linearifolium* Goldie, Edinb. Philos. Jour. vi. 322 (1822). *C. linearifolia* Lunell, Am. Midland Nat. iv. 514 (1916). *L. mandanense* Spreng. Syst. i. 544 (1825); Hook. Fl. Bor. Am. ii. 88, t. 166 (1838). *P. mandanensis* A. DC. Prodr. x. 87 (1846). *C. mandanensis* Lunell, Am. Midland Nat. iv. 515 (1916). *L. breviflorum* Engelm. & Gray, Jour. Boston Soc. Nat. Hist. v. 252 (1845). *L. asperum* Nels. Bull. Torr. Bot. Cl. xxvi. 244 (1899). *L. albicans* Greene, Pittonia iv. 91 (1899). *L. ciliolatum* Greene, l. c. 92. *L. oblongum* Greene, l. c. 92.—Extreme southern Ontario to Illinois and Manitoba, thence to Coahuila, Chihuahua, eastern Arizona, Utah and eastern British Columbia. This is a very variable, but certainly a natural assemblage which intensive study will probably show divisable into a number of good geographic varieties. Among normal plants there is considerable variation in size and form of corolla. The eastern material has very large corollas with conspicuously fringed lobes; material from Wyoming has very much smaller flowers; whereas material from Texas has small corollas with short entire lobes. Over most of its range the plant grows 2.5–4 dm. high, but in Wyoming it is commonly about 1 dm. tall.

Since the appearance of the note by Bebb, Am. Nat. vii. 691 (1873), and the acceptance of Bebb's findings by Gray, Synop. Fl. N. Am. ii. pt. 1, 205 (1878), this species has been considered dimorphic, including a phase with very conspicuous salverform normal corollas, and one with very inconspicuous cleistogamous flowers. These two phases are so different in appearance that they were formerly treated not only as of different species, but even of separate genera. Indeed so different do the two forms appear, that only the repeated acceptance of Bebb's findings and the complete lack of dissenting opinion during the last fifty years makes me at all content to associate the two forms under one specific name. I am somewhat troubled, however, at the apparent lack in the herbarium of forms transitional between the two phases. The two states differ in the following points. The normal form has simple erect stems terminated by a compact very floriferous inflorescence composed of short crowded branches bearing showy salverform apparently sterile corollas on erect pedicels. The cleistogamous phase is diffusely branched and bears its inconspicuous fertile flowers in very elongate racemes and its fruit on recurved pedicels.

The type of *L. linearifolium* Goldie, grew "only on sandy beaches

at the head of Lake Ontario." Recent collectors do not appear to have collected *L. angustifolium* there, and so it may be that Goldie's species is not properly referred to the older one of Michaux. However, "nuculis impresso-punctatis" and "foliis linearibus" of the short original description agree better with *L. angustifolium* than with any of the species that are known from the general region.

Several attempts have been made at giving this species special generic recognition. Justification for such steps have been found in the shape of the corolla, in its fimbriate lobes, and in its large faucal appendages. These, however, are all characters which are variable within the species and which would utterly fail to characterize a genus decisively. Halsted, Bot. Gaz. xiv. 202 (1889), has pointed out certain peculiarities of the pollen of this species which deserve further study, since they may furnish additional specific characters.

12. **L. tuberosum** Rugel in DC. Prodr. x. 76 (1846).—Tennessee to Georgia and southward to Alabama and Florida. This species can at once be recognized by its tuberous roots. Gray reported the species from Texas, but his record was based upon fruiting material of *Onosmodium Helleri* Small.

13. **L. cobrense** Greene, Bot. Gaz. vi. 157 (1881). (?) *L. tubuliflorum* Greene, Pittonia i. 155 (1888).—Southern Arizona and New Mexico southward to southern Durango. A species well characterized by its rather large very yellow corollas, rosettes of large basal leaves, and abruptly reduced cauline foliage.

14. **L. obovatum** Macbr. Contr. Gray Herb. n. s. xlviii. 56 (1916). —Known only from the type collection made at Quebrada Honda, Durango. It is perhaps better treated as a variety of *L. cobrense*, since it differs merely in having broader, more definitely obovate basal leaves.

15. **L. latifolium** Michx. Fl. Bor. Am. i. 131 (1803). *L. officinale*, var. *latifolium* Lehm. Asperif. ii. 311 (1818). *Cyphorima latifolia* Raf. in DC. Prodr. x. 76 (1846). *C. lutea* Raf. Cat. 13 (1824). *L. luteum* House, Bull. N. Y. State Mus. 243–244, pg. 61 (1923). *L. lutescens* Coleman, Cat. Pl. Grand Rapids 29 (1874).—Western New York to southern Minnesota and southward to eastern Tennessee. The Kew Index, iii. 99 (1894), gives the binomial, *L. latifolium*, as having been proposed by Forskål as well as by Michaux. Forskål did not publish such a binomial at the citation given by the Kew Index, i. e. "Fl. Aegypt. Arab. 39," and there appears to be no evidence that he ever published such a name.

16. **L. officinale** L. Sp. Pl. 132 (1753).—Native of Europe and the

Mediterranean region. Introduced in Que.!, N. B., Me.!, N. H.!, Vt.!, Mass.!, R. I., Conn.!, N. Y.!, N. J.!, Ont., Mich.!, Wis., Ohio, Ind., Minn.

17. **L. calcicola** Robins. Proc. Am. Acad. xxvii. 182 (1892).—Nuevo Leon southward to Oaxaca.

17a. **L. calcicola,** var. **Conzattii** (Greenm.), comb. nov. *L. Conzattii* Greenm. Bull. Field. Mus., Bot. ii. 339 (1912).—Known only from the type collection made in Oaxaca. Macbride, Contr. Gray Herb. n. s. xlviii. 55 (1916), considers this to be "only a young state of *L. calcicola,*" but because of its relatively large exserted corollas it appears to merit varietal rank at least.

18. **L. revolutum** Robins. Proc. Am. Acad. xxvii. 182 (1892). *Onosmodium revolutum* Macbr. Contr. Gray Herb. n. s. xlix. 21 (1917). —Known only from San Luis Potosi. Macbride, l. c., has referred this species to *Onosmodium*, considering the species most related in that genus yet with characters more or less intermediate between *Onosmodium* and *Lithospermum*. However, the species has a corolla with a funnelform throat and ascending lobes, a comparatively short and lobed style that is not exserted until the corolla is completely opened, oblong obtuse anthers, and unnerved leaves—all characters which unmistakably and definitely ally it with *Lithospermum* and exclude it from the habitally very different *Onosmodium*.

19. **L. obtusifolium**, sp. nov., perenne 1.5–3 dm. altum; caulibus paucis e radice longa et recte descendenti orientibus ascendentibus vel decumbentibus strigosis ramosis; foliis concoloribus enerviis strigosis sessilibus 2–3.5 cm. longis 3–9 mm. latis apicem versus latioribus oblongis vel linearibus inferioribus praecociter deciduis superioribus paullo reductis; floribus parvis inconspicuis 3–5 mm. longis; corolla calycem subaequali, lobis saepe laxe ascendentibus minus quam 1.4 mm. longis, tubo cylindrato intus glabro, faucibus appendiculatis; antheris oblongis longitudine filamenta aequantibus; pedicellis strictis 3–10 mm. longis; nuculis saepe 3 lucidis ca. 2.5 mm. longis.—MEXICO: sandy places near San Miguelito, San Luis Potosi, 1876, *Schaffner 728* (TYPE, Gray Herb.); Levios, 45 mi. E. of Saltillo, Coahuila, *Palmer 900;* Soledad, 25 mi. W. of Monclova, 1880, *Palmer.* UNITED STATES: Chiricahua Mine, Chiricahua Mts., Arizona, *Blumer 1796.*—The status of this species is somewhat dubious. The Mexican material comes from a small natural area and is probably homogeneous, although *Palmer 900* has very narrow somewhat involute leaves. The Arizonian material is without flowers. It is readily separable from all the species occurring in the United States, and matches sur-

prisingly *Shaffner 728*. Two of the cited specimens are mutilated, *Shaffner 728* and *Palmer 900* having had the main axis nipped off, apparently at an early age. These specimens may represent the cleistogamous phase of some species, but if so I have been unable to correlate it with any of the well known species. Since the plants form a definable group they are here described as representing an unnamed species. Part of the material was referred by Macbride to his *L. strictum*, var. *calycosum*.

20. **L. strictum** Lehm. Asperif. ii. 303 (1818). *Anchusa tuberosa* HBK. Nov. Gen. et Sp. iii. 92 (1818). *Heliotropium lithospermoides* R. & S. Syst. iv. 737 (1819).—Southern Coahuila southward to the states of Mexico and Puebla; most frequently collected in San Luis Potosi. This is an exceptionately well marked species characterized by its thickened fusiform or bottle-shaped root, very narrow leaves, compressed sharply keeled nutlets, and very long simple inconspicuously bracted unilateral racemes of elongate salverform corollas. In gross aspect the plant somewhat suggests *Amsinckia Douglasiana* DC.

21. **L. Seleri**, sp. nov., perenne; caulibus ascendentibus stramineis simplicibus strigosis et hirsutis ca. 3 dm. altis; foliis lanceolatis acutis 2.5–4.5 cm. longis 4–10 mm. latis breviter petiolatis conspicue nervosis, supra pustulatis, infra pallidioribus strigosis; racemis geminatis terminalibus hispidis; floribus luteis ca. 1 cm. longis, corollae tubo cylindrato extus villoso intus glabro calycem paullo longiori, lobis laxe ascendentibus ca. 2 mm. longis, faucibus granulatis; antheris oblongis quam filamenta longioribus; calycibus fructiferis ca. 8 mm. longis hispidis, lobis linearibus quam nuculae duplo longioribus: nuculis ca. 2.5 mm. longis. MEXICO: near Puebla, July 1888, *Seler 847* (TYPE, Gray Herb.).—This species appears to be most closely related to *L. mediale* Johnston, but differs from that in its spreading stiff pubescence, stramineous stems, and longer calyx-lobes. The type has been mutilated and has a number of ascending branches. It seems to have a weak perhaps only biennial root.

22. **L. mediale**, sp. nov., perenne 3–5 dm. altum canescens; caulibus erectis simplicibus vel apicem versus breviter ramosis compluribus a radice simplici recta orientibus foliosis strigosis; foliis strictis vel ascendentibus firmis oblongo-ovatis vel lanceolatis saepe concoloribus strigosis rare supra pustulatis (saepe cum nervis paucis validisque) subsessilibus 3–6(–9) cm. longis 4–13(–17) mm. latis superne paullo reductis; racemis terminalibus geminatis vel ternatis; floribus ochroleucis ca. 1 cm. longis, corollae tubo cylindrato calyce saepe duplo

longiori extus villoso intus glabro; lobis laxe ascendentibus vel divergentibus 1–2 mm. longis, faucibus appendiculatis; antheris oblongis quam filamenta duplo longioribus; pedicellis 1–2 mm. longis strictis; calycibus fructiferis ca. 5 mm. longis, lobis linearibus quam nuculae vix longioribus; nuculis saepe 2–3 albis nitidis 2.5–3 mm. longis.—GUATEMALA: on cultivated ground, trachyte mountain Chi Lahuh K'ik, Dept. Quezaltenango, June 10, 1896, *Seler 2893* (TYPE, Gray Herb.); San Lucas, Dept. La Antigua, *Seler 2462*; Santiago, Dept. Zacatepeque, *Gomez 812*. COLOMBIA: Sibate, Dept. Cudinamarca, *Pennell 2468* (NY, G); Zipacon, Dept. Cundinamarca, *Rusby & Pennell 1217* (G); El Dintel, *Bro. Ariste-Joseph A.525* (G); San Antonio, *Bro. Ariste-Joseph A.447* (G); Facatative, *André 669* (NY); vicinity of Bogotá near Tequendama Falls, Dec. 1852, *Holton* (NY); without locality, *Bro. Ariste-Joseph B-44* (US). VENEZUELA: between Mucurulea and Mucuchies, Dept. Los Andes, *Jahn 801* (NY).—This very characteristic species is apparently restricted to central and northern South America. It has been mainly confused with the very different *L. discolor* Mart. & Gal., although its closest relative appears rather to be *L. distichum* Ort. The new species can be usually recognized by its canescence, firm leaves with few or no strong veins, short calyx-lobes that just exceed the nutlets, and very pale yellowish corollas. Material from Guatemala and Colombia seems quite indistinguishable, and is evidently referable to a single species. I have a suspicion that Kuntze's *L. discolor*, var. *subviride*, Rev. Gen. ii. 439 (1891), was based on a plant of this species.

23. **L. guatemalense** Donn. Sm. Bot. Gaz. xxvii. 436 (1899).—This was described from a collection made in the Dept. of Heuheutenango, in southeastern Guatemala. I have seen no authentic material of the species, but associate with it the left-hand plant on the sheet of *Ghiesbreght 804* now preserved in the Gray Herbarium. I have strong suspicions that *L. guatemalense* will be found to be merely a narrow-leaved phase of *L. oblongifolium* Greenm.

24. **L. oblongifolium** Greenm. Proc. Am. Acad. xxxii. 300 (1897). (?) *L. discolor*, var. *canescens* Kuntze, Rev. Gen. ii. 439 (1891).—I know of only two collections, one, the type, collected in the Federal District of Mexico, the other collected by Ghiesbreght (no. *804* in part) in the pine forests of southern Mexico. The latter is coarsely hirsute and I associate with it Kuntze's varietal name.

25. **L. Palmeri** Wats. Proc. Am. Acad. xviii. 122 (1883).—Nuevo Leon and adjacent Coahuila. This differs from *L. viride* Greene, in pubescence, somewhat coarser habit, and isolated southern range,

and might with good reasons be treated as a geographic variety of that species.

26. **L. viride** Greene, Bot. Gaz. vi. 158 (1881).—Southern New Mexico and Arizona.

27. **L. ruderale** Dougl. in Lehm. Pug. ii. 28 (1830). *L. pilosum* Nutt. Jour. Acad. Philad. vii. 43 (1834). *Batschia pilosa* Don, Gen. Syst. iv. 372 (1838). *L. Torreyi* Nutt. l. c. 44. *B. Torreyi* Don, l. c. *L. ruderale,* var. *Torreyi* Macbr. Contr. Gray Herb. n. s. xlviii. 55 (1916). *L. laxum* Greene, Pittonia iii. 263 (1898). *L. lanceolatum* Rydb. Mem. N. Y. Bot. Gard. i. 333 (1900). *L. ruderale,* var. *lanceolatum* Nels. Bot. Gaz. lii. 272 (1911). *L. ruderale,* var. *macrospermum* Macbr. l. c.—Southern Alberta to western Colorado, westward to British Columbia and northern California. Although constant in its very characteristic leafy inflorescence, the species varies in size of nutlets and corollas, in pubescence, and in leaf-shape. The most striking and important of these variations is the var. *macrospermum,* the prevailing if not the only form of the species in eastern Oregon, and adjacent Idaho, Nevada and California. This variety has comparatively large nutlets, 5–8 mm. long (the largest in the genus), which have a very prominent basal flange.

28. **L. calycosum** (Macbr.), comb. nov. *L. strictum,* var. *calycosum* Macbr. Contr. Gray Herb. n. s. xlviii. 56 (1916).—Southern San Luis Potosi, Guanajuato and Hidalgo. Although originally described as a variety of *L. strictum* this species is abundantly distinct, differing in its unthickened root, branched habit, broader leaves, and terete unkeeled nutlets.

29. **L. multiflorum** Torr. in Gray, Proc. Am. Acad. x. 51 (1874); Wats. Bot. King Exped. 238 (1871), nom. nud.—Southern Wyoming southward to Arizona and northern Chihuahua.

30. **L. canescens** (Michx.) Lehm. Asperif. ii. 305 (1818). *Batschia canescens* Michx. Fl. Bor. Am. i. 130, t. 14 (1803). *Anchusa canescens* Muhl. Cat. 19 (1813). *A. virginiana* L. Sp. Pl. 133 (1753); not *L. virginianum* L. l. c. 132. *L. sericeum* Lehm. Asperif. ii. 306 (1818). *B. sericea* R. & S. Syst. iv. 743 (1819). *B. conspicua* R. Br. in Richards. Bot. App. to Frankl. Jour. 732 (1823).—Along the Appalachians from southern Pennsylvania south into Alabama and westward through Ohio to Kansas and Saskatchewan.

31. **L. caroliniense** (Walt.) MacMill. Metasp. Minn. Valley 438 (1892). *Anonymos caroliniense* Walt. Fl. Carolina 91 (1788). *Batschia caroliniensis* Gmel. Syst. i. 315 (1791). *L. carolinianum* Lam. Tab. Encyc. i. 397 (1791); Mack. Bull. Torr. Bot. Cl. xxxii. 501

(1905). *Onosmodium carolinianum* A. DC. Prodr. x. 70 (1846). *B. Gmelini* Michx. Fl. Bor. Am. i. 130 (1803). *L. Gmelini* Hitchc. Spring. Fl. Manhattan 30 (1894). *Anchusa hirta* Muhl. Cat. 19 (1813); nom. nud. *L. hirtum* Lehm. Asperif. ii. 304 (1818). *L. strigosum* Raf. New Fl. N. Am. pt. 4, 18 (1836). *L. bejariense* A. DC. Prodr. x. 79 (1846).—Western New York west to Montana, and southward through Nebraska to Texas, Tamaulipas and Louisiana. Also in South Carolina, Georgia, and Florida.

32. **L. californicum** Gray, Proc. Am. Acad. x. 51 (1875).—Northern California and adjacent Oregon.

13. **Antiphytum** DC. in Meisner, Genera i. 280; ii. 188 (1840).

Amblynotopsis Macbr. Contr. Gray Herb. n. s. xlviii. 41 (1916).—A review of this genus has been recently published, Contr. Gray Herb. n. s. lxviii. 48–52 (1923). Recent study has shown, however, that the species there called *Antiphytum tetraquetrum* is properly excluded from the genus and should be referred to *Thaumatocaryon*.

14. **Mimophytum** Greenm. Proc. Am. Acad. xli. 242 (1905).

Mimophytum omphalodoides Greenm. Proc. Am. Acad. xli. 242 (1905).—This monotype is known only from the type collection taken from under a wet cliff in the barranca below Honey Station, 1500 m. alt., Puebla, Mexico, by Pringle in 1904. In gross aspect the plant remarkably simulates the Mexican species of *Omphalodes*, although in technical fruiting characters it seems quite distinct and much nearer *Cynoglossum*.

15. **Cynoglossum** [Tourn.] L. Sp. Pl. 134 (1753); Gen. Pl. 65 (1754).

KEY TO SPECIES.

Nutlets sunken in dorsally and having a definite elevated margin.
  Plant a slender freely branched annual; nutlets small, 2–3 mm. long, dorsal area practically unarmed ..... 1. *C. Wallichii.*
  Plant a coarse biennial, branched only above; nutlets large, 5–10 mm. long, dorsal area densely armed.
    Nutlets 5–7 mm. long, ovate in dorsal outline; style well developed, surpassing mature nutlets by 3–5 mm.; Eurasian ..... 2. *C. officinale.*
    Nutlets 8–10 mm. long, suborbicular in dorsal outline; style weakly developed, 1–2 mm. long, obscured and surpassed by nutlets; Mexican ..... 3. *C. Pringlei.*
Nutlets not sunken in dorsally and lacking a definite elevated margin.
  Plant biennial; European introductions.
    Corolla small, 4–5 mm. long; nutlets small, 2.5–4 mm. long; leaves all acute, upper ones with a narrow cuneate base. 4. *C. zeylanicum.*

Corolla large, 6–8 mm. long; nutlets large, ca. 6 mm. long; some of leaves usually obtusish, at least upper with a broad subamplexicaul base.....5. *C. creticum*.
Plant perennial; native American species.
Nutlets small, 2–3 mm. long, equalled or exceeded by calyx-lobes.
Fruiting pedicels 2–3 cm. long, stiffly and horizontally extended; calyx-lobes reflexed at maturity, 2–2.5 mm. long, about equalling fruit.....6. *C. paniculatum*.
Fruiting pedicels 0.5–1 cm. long, recurved; calyx-lobes spreading at maturity, 3–5 mm. long, much exceeding the fruit.....7. *C. limense*.
Nutlets larger, 4–10 mm. long, if less than 5 mm. long then conspicuously exceeding the calyx-lobes.
Mature leaves glabrous on upper surface; stems glabrate or sparingly hirsute or strigose.
Leaves tapering at base; stems strigose above; pedicels recurved in fruit; corolla-appendages semilunate, included; South American.....8. *C. Trianaeum*.
Leaves abruptly contracted to a slender petiole; stems glabrous above; fruiting pedicels ascending or gracefully outcurved; corolla-appendages oblong, protruded; North American.....9. *C. grande*.
Mature leaves evidently hirsute or hispid on upper surface; stems conspicuously hirsute.
Calyx-lobes 5–10 mm. long in fruit, linear or lanceolate; corolla-tube 3–5 mm. long, about twice length of lobes; style conspicuous, 5–9 mm. long.
Stems villous; leaves 10–16 mm. broad; stamens slightly exserted from throat.....10. *C. viride*.
Stems hirsute; leaves 15–30 mm. broad; stamens included.....11. *C. occidentale*.
Calyx-lobes 1–2.5 mm. long in fruit, ovate; corolla-tube 1.5–3 mm. long, exceeded by the lobes; style obscured by the nutlets, 1–2 mm. long.
Nutlets 5.5–7 mm. long.....12. *C. virginianum*.
Nutlets 3.5–5 mm. long.....13. *C. boreale*.

1. **Cynoglossum Wallichii** Don, Gen. Syst. iv. 354 (1837). *C. glochidatum* Wall. Cat. 26 (1829), nom. nud.; Benth. in Royle, Ill. i. 306 (1839).—Native of central Asia and India. Adventive in 1902 in a garden at Hardwick, Mass.

2. **C. officinale** L. Sp. Pl. 134 (1753).—Native of Eurasia, extending from the western Mediterranean region eastward to central Asia. Introduced in Que.!, Me., N. H., Vt.!, Mass.!, R. I.!, Conn.!, N. Y.!, N. J., Penn.!, Md., Del., Va.!, W. Va.!, N. C., Ont.!, Mich.!, Ohio!, Ind.!, Ill.!, Tenn., Ky., Ala., Wis., Iowa!, Mo.!, Ark., Neb., Kan.!, N. D., Mont., Wyo.!, Colo.!, Ut.!, N. M., Ore.!

3. **C. Pringlei** Greenm. Proc. Am. Acad. lx. 30 (1904).—Mexico: Fultenango Canyon, State of Mexico, *Pringle 17350* (type); vicinity of Moralia, Michoacan, *Arsène 5949;* Guanajuato, 1893, *Dugès*.—Although closely related to *C. officinale* this species, a native of south

central Mexico, is clearly distinct in its larger and differently shaped nutlets and short style. Frequently only a single nutlet is matured from each flower.

4. **C. zeylanicum** (Vahl.) Thunb. in Lehm. Neue Schrift. Naturf. Gess. Halle ser. 3, ii. 20 (1817). *Anchusa zeylanica* Vahl. in Hornm. Enum. Hafn. 3 (1807), hyponym? *C. furcatum* Wall. in Roxb. Fl. Ind. ii. 6 (1824).—Native of southeastern Asia. In the United States National Herbarium there is a specimen of this species collected in 1899 by Dr. O. Buchtien at Valdivia, Chile. The species is not otherwise known from America.

5. **C. creticum** Mill. Gard. Dict. ed. 8. (1768); Brand, Pflanzenr. iv. Fam. 252, i. 129 (1921). *C. pictum* Soland, in Ait. Hort. Kew. i. 179 (1789). *C. molle* Phil. Linnaea xxix. 18 (1857).—Native of the Mediterranean region. Long ago naturalized in south central Chile whence it was described as a native species by Philippi.

6. **C. paniculatum** H. & A. Bot. Beech. 37 (1830). *C. Azocarti* Phil. Anal. Univ. Chile lxv. 62 (1884). *C. paniculatum*, var. *Azocarti* Reiche, Anal. Univ. Chile cxxi. 248 (1908). *C. paniculatum*, forma *Azocarti* Brand, Pflanzenr. iv. Fam. 252, i. 137 (1921). *C. paniculatum*, forma *Philippianum* Brand, l. c.—South central Chile. Reiche, l. c., attributes the species to Peru. The plant is well marked by its exceptionally elongate pedicels.

7. **C. limense** Willd. Sp. Pl. i. 762 (1798); Brand, Pflanzenr. iv. Fam. 252, i. 142 (1921). *C. decurrens*, var. *limense* A. DC. Prodr. x. 153 (1846). *C. decurrens* R. & P. Fl. Peruv. ii. 6 (1799). *C. alatum* Molina, Sagg. Chile ed. 2, 280 (1810).—Middle and southern Chile. The type of the species is reputed to have come from the vicinity of Lima, Peru.

8. **C. Trianaeum** Wedd. Chlor. And. ii. 90 (1859).—Mountains of Colombia and adjacent Ecuador.

9. **C. grande** Dougl. in Lehm. Pug. ii. 25 (1830). *C. laeve* Gray, Synop. Fl. N. Am. ii. pt. 1, 188 (1878). *C. grande*, var. *laeve* Gray, l. c. suppl. 421 (1886) (?) *C. Austinae* Eastw. Bull. Torr. Bot. Cl. xxxii. 203 (1905).—From Monterey and Calaveras counties, California, northward to extreme southern British Columbia.

10. **C. viride** Eastw. Proc. Calif. Acad. Sci. ser. 2, vi. 428, t. 59 (1897).—Sierra Nevada, California, from Calaveras to Tulare counties.

11. **C. occidentale** Gray, Proc. Am. Acad. x. 58 (1875).—From Plumas and Glen counties, California, northward to central Oregon.

12. **C. virginianum** L. Sp. Pl. 134 (1753). *C. virginicum* L. Syst.

ed. 12, 146 (1767). *C. amplexicaule* Michx. Fl. Bor. Am. i. 132 (1803). *C. lucidum* Stokes, Bot. Mat. Med. i. 277 (1812).—Southern Connecticut southward to northern Florida, west to Louisiana and Missouri.

13. **C. boreale** Fernald, Rhodora vii. 250 (1905).—New Brunswick and adjacent Quebec, southward to northern Connecticut, westward through New York and southern Ontario to northern Michigan; reappearing in southern British Columbia. All the vegetative characters of this species can be matched, after a short search, among indubitable material of *C. virginianum*. It usually differs, however, in its more slender habit, less stiff pubescence, more elongate slender pedicels, and smaller floral parts; and seems to be always distinct in its smaller nutlets and northern range. Brand, Pflanzenr. iv. Fam. 252, i. 131 (1921), reduces the species outright to *C. virginianum*, but surely it is deserving of varietal rank at the very least.

16. **Pectocarya** DC. in Meisner, Genera i. 279; ii. 188 (1840).

Ktenospermum Lehm. Del. Sem. Hort. Hamburg 17 (1837), nom. nud. *Gruvelia* A. DC. Prodr. x. 119 (1846).

Key to Species and Varieties.

Nutlet-margins lacerate or undulate or uncinate-bristly, usually ascending or erect. § *Eupectocarya*.
- Back of nutlets armed with coarse subulate appendages similar to those forming the margin ..... 1. *P. anomala*.
- Back of nutlets without coarse subulate appendages; margin well defined.
  - Plant erect, ascendingly branched above; body of nutlets obovate; calyx-lobes surpassing the nutlets ..... 2. *P. lateriflora*.
  - Plant prostrate or decumbent, much branched from the base; body of nutlets usually linear or oblong, rarely somewhat obovate; calyx-lobes equaled or surpassed by nutlets.
    - Nutlets with margins pectinately lacerate or dentate to near base and in addition usually uncinate-bristly about apex ..... 3. *P. gracilis*.
      - Fruit similar throughout plant, not dimorphic.
        - Body of nutlets definitely linear.
          - Nutlet-margin very narrow and inconspicuous .. var. *genuina*.
          - Nutlet-margin broad and very conspicuous .... var. *platycarpa*.
        - Body of nutlets obovate or oblong-obovate ..... var. *boliviana*.
      - Fruit dimorphic, with normal divaricate nutlets borne on branches and peculiar reflexed persistent ones borne about base of plant ..... var. *dimorpha*.
    - Nutlets with margins entire or undulate along sides, armed only at apex where densely uncinate-bristly. 4. *P. penicillata*.
    - Nutlets similar, all margined; fruit not dimorphic, similar in all parts of plant ..... var. *genuina*.

Nutlets dissimilar, fruit on the branches consisting of two evidently margined and two unmargined nutlets, fruit borne at base of plant with consimilar unmargined strongly reflexed nutlets . . . var. *heterocarpa*.

Nutlet-margin entire, lacking uncinate-hairs or lacinae or teeth.

§ *Gruvelia*.

Nutlets equally divergent, marginless, obviously angular and rhomboid in outline; calyx-lobes strigose with appressed uncinate hairs towards the tip; plant very slender, branched mainly near base, sparsely strigose . . . . . 5. *P. pusilla*.

Nutlets divergent in pairs, some usually wing-margined, obscurely angular, obovate or rhomboid-obovate in outline; calyx-lobes strigose and sparsely spreading hirsute; plant stiffish, becoming freely branched, very strigose . . . . 6. *P. setosa*.

Fruit with nutlets all wing-margined . . . . . var. *holoptera*.

Fruit with some of nutlets lacking a wing-margin.

Nutlets all marginless . . . . . var. *aptera*.

Nutlets margined and unmargined in the same fruit . . . . var. *genuina*.

1. **Pectocarya anomala**, sp. nov., erecta 7–15 cm. alta dichotoma strigosa supra laxe ramosa; foliis linearibus 1–3 cm. longis 0.8–1 mm. latis sparse hispidis inferioribus oppositis; pedicellis recurvatis quam bracteae foliaque multo brevioribus; sepalis lanceolatis quam nuculae paullo longioribus; nuculis obovato-oblongis ca. 0.7–0.8 mm. latis 1.5–1.7 mm. longis granulatis, dorso et marginibus cum appendicibus valdis uncinatis subulatis subteretibus uncinato-pubescentibus ca. 1–1.2 mm. longis munitis, marginibus inconspicuis.—PERU: sandy pampa on the southern slope of Chachani Mountain near Arequipa, 2400 m. alt., *Mr. & Mrs. F. E. Hinkley 41* (TYPE, Gray Herb.).—Although in habit clearly a *Pectocarya* this species is quite anomalous in the genus in having the back of the nutlet, not unarmed and margined, but studded with coarse uncinate subulate uncinately pubescent appendages which are quite indistinguishable from those of the proper margin. The plant is erect-growing with a few loosely ascending branches from above the middle. In this habit it differs from *P. gracilis* and *P. penicillata*, and agrees with *P. lateriflora*. It is, however, a lower, less stiff, and less strictly branched plant than the latter. According to its collectors the plant is locally known as "estrella gateadora."

2. **P. lateriflora** (Lam.) DC. Prodr. x. 120 (1846). *Cynoglossum lateriflorum* Lam. Encycl. ii. 239 (1786); Planch. t. 92, fig. 2 (1791). *Mattia lateriflorum* Don, Gen. Syst. iv. 310 (1838). *C. pilosum* R. & S. Fl. Peruv. ii. 6, t. 111b (1799). *M. pilosa* Don, l. c. *Rindera pilosa* R. & S. in DC. l. c. (?) *Ktenospermum linifolium* Lehm. Linnaea xii. Lit. 84 (1838); nom. nud.—Brand, Pflanzenr. iv. Fam. 252, i. 95 (1921), has taken *P. lateriflora* as including the two following

species, but as here taken it is in a much more limited sense and restricted to the Peruvian plants originally described. The species is known only from the western strip of Peru, and is well characterized by its erect habit of growth.

3. **P. gracilis** (R. & P.), comb. nov. *Myosotis gracilis* R. & P. Fl. Peruv. ii. 5 (1799). *Echinospermum gracile* Lehm. Asperif. i. 129 (1818). *Rochelia gracilis* R. & S. Syst. iv. 111 (1819). *Cynoglossum lineare* R. & P. l. c. 6. *P. linearis* DC. Prodr. x. 120 (1846). *P. chilensis* DC. l. c. (?) *P. chilensis*, var. *californica* Torr. Pacif. R. R. Rep. iv. 124 (1857).

3a. **P. gracilis**, var. **genuina.**—This is the common species of *Pectocarya* in Chile and Argentina. It is uncommon in North America, apparently restricted there to Southern California and to the islands off that coast. The following cited collections represent all the material of true *P. gracilis* which I have seen from North America.—San Diego, *Brandegee 1636* (G, P); 'Granite, San Diego County, *Spencer 115* (G); Palm Springs, *Margaret Ferguson 41* (Wellesley College Herb.); Butte west of Lakeview, 1920, *Johnston* (P); Temescal Canyon, *Munz & Harwood 3387* (G); foothills of San Bernardino Mts., 1896, *Cummings* (G); Claremont, *Munz 2005* (P), *Baker 4135* (P); Surprise Canyon, Panamint Mts., *Coville & Funston 721* (G); Santa Cruz Island, 1887, *Ford* (G); Catalina Island, *Grant 913* (G); Clemente Island, *Munz 6690* (G, P); Guadalupe Island, *Palmer 69a* (G), *Anthony 237* (G).

✓ 3b. **P. gracilis**, var. **platycarpa** Munz & Johnston, var. nov., ascendens saepe robustior; margine nuculae grosse dentato ca. 1 mm. lato valde conspicuo.—ARIZONA: Tempe, 1892, *Ganong & Blaschka* (G); Wickenburg, *W. W. Jones 88* (G); Tucson, *Greene 1109* (G); mesas near Camp Lowell, April 16, 1881, *Pringle* in part (TYPE, Gray Herb.); without locality, 1884, *Pringle* (G). UTAH: valley of Virgin near St. George, *Parry 167* (G). CALIFORNIA: Agua Caliente, *Parish Bros. 122* (G); Chuckawalla Valley, *Munz & Keck 4804* in part (G); Providence Mts., *Munz & Harwood 3532* (P), *3535* in part (P); east of Daggett, *Munz & Harwood 3673* (P).—This well marked variety seems to replace the var. *genuina* in the deserts of California, Arizona, and Utah. With only North American material at hand the plant seems so extreme and positive as to merit specific rank. However, the South American material of the var. *genuina* frequently has rather broadly margined nutlets that show an approach to the condition characteristic of the var. *platycarpa*, and it hence seems best to treat the latter merely as a variety of the same species.

3c. **P. gracilis**, var. **boliviana**, var. nov., ramosa prostrata; nuculis obovatis vel oblongo-obovatis.—BOLIVIA: Chignana, 3700 m. alt., *Asplund 3897* (TYPE, U. S. Nat. Herb.); Challapata, 3900 m. alt., *Asplund 5895* (US); Teneral Campero, 4200 m. alt., *Asplund 5894* (US); Atocha, 3700 m. alt., *Asplund 5896* (US).—This appears to be the northern phase of *P. gracilis* in South America. The cited suite of specimens is uniform in the crucial characters of the variety, the obovate body of the nutlet, but as to margining varies from conspicuously pectinate-dentate to almost naked.

3d. **P. gracilis**, var. **dimorpha**, var. nov., ramosa prostrata; fructis dimorphis, superioribus nuculas divaricatas compressas normales gerentibus, infimis nuculas reflexas crassas persistentes gerentibus; nuculis oblongis.—CHILE: Vallemar, *Rose 19331* (US); Desert of Atacama, *Morong 1282* (TYPE, Gray Herb.; ISOTYPE, N. Y. Bot. Gard.).—This plant of northern Chile is evidently not typical of the var. *genuina* and because of its conspicuously dimorphic nutlets appears to deserve special varietal recognition. The normal nutlets have a very broad, erect, merely toothed margin.

4. **P. penicillata** (H. & A.) A. DC. Prodr. x. 120 (1846). *Cynoglossum penicillatum* H. & A. Bot. Beech. 371 (1840). *P. linearis*, var. *penicillata* Jones, Proc. Calif. Acad. Sci. ser. 2, v. 709 (1895). *P. miser* Nels. Bot. Gaz. xxxvii. 278 (1904).—In its two forms this is the most common and widely distributed of the North American Pectocaryas. Brand, Pflanzenr. iv. Fam. 252, i. 95 (1921), takes up *Cynoglossum Nuttallii* Spreng., Syst. i. 566 (1825), as the earliest name of the present species. Sprengel's name, however, is based upon *C. pilosum* of Nuttall, Gen. i. 114 (1818), which is, as Gray, Synop. Fl. N. Am. ii. pt. 1, 190 (1878), has indicated, a species of *Lappula*.

4a. **P. penicillata**, var. **genuina**.—Ranging from British Columbia, Idaho and southwestern Wyoming southward to northern Nevada and Lower California. In Arizona, southern Nevada, and the deserts of California it is replaced by the following variety.

4b. **P. penicillata**, var. **heterocarpa**, var. nov., deserticola; nuculis heteromorphis, duabus marginatis, duabus emarginatis gracilioribus paullo reflexis.—ARIZONA: Tempe, 1892, *Ganong & Blaschka* (G); Camp Grant, *Palmer 182* (G); near Camp Lowell, 1881, *Pringle* in part (G); without locality, 1876, *Palmer* (G). NEVADA: Moapa, *Goodding 2200* (G); St. Thomas, *Tidestrom 8642* (G). CALIFORNIA: Ft. Yuma, *Major Thomas* (G); (?) Colorado River, 1854, *Bigelow*; Coahuilla Valley, 1901, *Hall* (G); Surprise Canyon, Panamint Mts., *Coville & Funston 721* in part (G); Providence Mts., *Munz & Harwood*

3435 in part (P); near Daggett, *Munz & Harwood 3673* in part (P); north of Randsburg, 1922, *Pierce* (P); Corn Springs, Chuckawalla Valley, 1922, *Munz & Keck 4870* (TYPE, Pomona College Herb.); Chuckawalla Valley, *Munz & Keck 4804* in part (G); Paloverde Valley, 1905, *Wilder* (P); Palm Springs, *Spencer 115* (P). The following collections appear intermediate between var. *genuina* and var. *heterocarpa*. Hemet, *Baker 4139* (P); near Cabazon, *Munz, Street & Williams 2387* (P); Santa Susana Mts., *Brewer 210* (G); Oil City, *Heller 7586* (G).—The nutlets of this variety are dissimilar, two of each fruit usually being unmargined, thicker, and somewhat reflexed. The fruit borne about the base of the plant is different from that borne well out on the branches and perhaps is produced by cleistogamous flowers. The nutlets of this fruit are usually consimilar, all are strongly reflexed, very thickened, and broadly and permanently affixed to the gynobase. Similar fruit is found in the Chilian *P. gracilis*, var. *dimorpha*.

5. **P. pusilla** (A. DC.) Gray, Proc. Am. Acad. xii. 81 (1876). *Gruvelia pusilla* A. DC. Prodr. x. 119 (1846); Gay, Fl. Chile iv. 482, t. 52, fig. 3 (1849). *P. pusilla*, var. *flagillaris* Brand, Pflanzenr. iv. Fam. 252, i. 96 (1921).—West of the high mountains from southern Washington to middle (Fresno County) California; also in Chile where very rare. Brand, l. c., considers the North American plant varietally distinct from the South American, arguing that it has more slender, elongate stems. Though the northern material may frequently attain greater slenderness and height than the southern, the two are certainly indistinguishable at times.

6. **P. setosa** Gray, Proc. Am. Acad. xii. 81 (1876). *Gruvelia setosa* Rydb. Bull. Torr. Bot. Cl. xl. 479 (1913).—This species is confined to western North America and breaks up into three geographic varieties as follows:—

6a. **P. setosa**, var. **genuina.**—Washington and Idaho in the arid interior, southward into Utah and Arizona, and along the Sierras to the Mohave and northern Colorado Deserts. This is the common and typical phase of the species having two of the four nutlets winged, and two wingless with the latter pair partially hidden by the former.

6b. **P. setosa**, var. **aptera**, var. nov., australis; nuculis vix alatis vel omnino apteris.—CALIFORNIA: Warners Hot Spring, *Eastwood 2620* (G); dry canyon floor near Campo, 1903, *Abrams 3571* (TYPE, Gray Herb.).—The nutlets of this variety are quite similar to those of *P. pusilla*. The specimens referred here come from the western

side of the Colorado Desert and represent the only material of the species seen from the area.

6c. **P. setosa**, var. **holoptera**, var. nov., mohavensis; nuculis omnibus late aequaliterque alatis.—CALIFORNIA: White Mts. east of Laws, *Heller 8187* (G); Granite Wells, Mohave Desert, 1922, *Johnston 6489* (TYPE, Pomona College Herb.); near Mohave, 1920, *Johnston* (P); Mt. Pinos, *Hall 6423* (P).—This form, characterized by having all its nutlets broadly and equally winged, occurs along the northwest edge of the Mohave Desert.

17. **Omphalodes** Moench, Meth. 419 (1794).

KEY TO SPECIES.

Cauline leaves sessile, oblong-linear or lanceolate; corolla white; introduced plants.....1. *O. linifolia.*
Cauline leaves long-petiolate, blades more or less cordate; corolla blue or bluish; indigenous plants, mainly Mexican.
  Flowers in naked racemes with only the lowermost if any bracteate; annual.....2. *O. aliena.*
  Flowers all axillary; short-lived perennials.
    Corolla large, 10-14 mm. broad; leaves herbaceous, lower ones 25–35 mm. broad.....3. *O. acuminata.*
    Corolla small, 5–7 mm. broad; leaves firm, largest lower ones only 10-15 mm. broad.
      Leaves with evident veining, sharply acute or acuminate, rather sparsely strigose; pedicels shorter or but little exceeding the bracts.....4. *O. cardiophylla.*
      Leaves with obscured veining, broadly acute, velutinous with a dense short pubescence; pedicels twice exceeding the subtending leaves.....5. *O. mexicana.*

1. **Omphalodes linifolia** (L.) Moench, Meth. 419 (1794). *Cynoglossum linifolium* L. Sp. Pl. 134 (1753).—Native of southwestern Europe. Reported by Hooker, Fl. Bor. Am. ii. 86 (1838), from Labrador. Collected in 1919 on street parking in Salem, Oregon, by J. C. Nelson.

2. **O. aliena** Gray in Hemsl. Biol. Centr. Amer. Bot. ii. 377 (1882).—TEXAS: common, rocky hillsides, Sanderson, *H. C. Hanson 381.* NUEVO LEON: limestone hills near Monterey, 600 m. alt., *Pringle 10205, 10206;* Monterey, 1880, *Palmer 893* (TYPE).

3. **O. acuminata** Robins. Proc. Am. Acad. xxvi. 170 (1891).—NUEVO LEON: Sierra Madre near Monterey, *Pringle 2220* (TYPE); limestone ledges of Sierra Madre above Monterey, *Pringle 10162.*

4. **O. cardiophylla** Gray in Hemsley, Biol. Centr. Amer. Bot. ii. 377 (1882).—PUEBLA: Boca del Monte on shaded mountain slopes, *Purpus 2498.* COAHUILA: mountains near Saltillo, *Palmer 894* (TYPE).

5. **O. mexicana** Wats. Proc. Am. Acad. xxv. 158 (1890).—Nuevo Leon: fissures of dry lime rock, Sierra Madre near Monterey, *Pringle 1878* (type).

18. **Harpagonella** Gray, Proc. Am. Acad. xi. 88 (1876).

Harpagonella Palmeri Gray, Proc. Am. Acad. xi. 88 (1876); Baill. Bull. Mens. Soc. Linn. Paris no. 102, 812 (1889); Hist. Pl. x. 351, fig. 266–8 (1890); Gürke in E. & P. Nat. Pflanzenf. iv. Abt. 3a, 130, fig. 53 (1891).—An anomalous monotype known only from Pima and Cochise counties in southern Arizona, extreme southwestern California in western San Diego and southwestern Riverside counties, extreme northwestern Lower California, and on the Guadelupe and Santa Catalina Islands.

19. **Myosotis** [Dill.] L. Sp. Pl. 131 (1753); Gen. Pl. 63 (1754).

Key to Species.

Inflorescence leafy-bracted nearly throughout; corolla-tube at least a third longer than calyx; prostrate antarctic perennials.
Corolla white, limb ca. 4 mm. broad; pedicels equalling calyx and becoming 1–2 mm. long; nutlets ca. 1.8 mm. long, 1.2 mm. broad; plant sparsely short-hairy ..... 1. *M. albiflora.*
Corolla blue, limb ca. 2.5 mm. broad; calyx subsessile; nutlets ca. 1.3 mm. long, 0.8 mm. broad; plant long-hairy throughout ..... 2. *M. antarctica.*
Inflorescence naked or rarely with the lowermost flowers bracteate; corolla-tube little if at all exceeding calyx; mostly erect annuals.
Hairs on calyx few, short, straight, closely appressed, eglandular; aquatic or marsh plants.
Style commonly much exceeding the nutlets and about equalling calyx-tube; corolla large, 6–9 mm. broad; calyx-lobes commonly shorter than tube; inflorescence usually completely bractless; stems rather coarse, angled, usually ascending, stoloniferous at base. . 3. *M. scorpioides.*
Style clearly exceeded by nutlets and shorter than calyx-tube; corolla rather small, 3–6 mm. broad; calyx-lobes about equalling the tube; main branches of inflorescence bracted at base; stems slender, terete, branched at base, not stoloniferous ..... 4. *M. laxa.*
Hairs on at least basal portion of calyx uncinate or gland-tipped; plants of well drained soil.
Plants conspicuously densely retrorse-hirsute below, rather coarse and loosely decumbent; leaves broadly oblanceolate, contracted to a narrow well developed petiole . . 5. *M. azorica.*
Plants not conspicuously retrorse-hirsute, rather slender, mainly erect; leaves oblong or lanceolate, lacking well developed petioles.
Plants densely tufted; stems with loose papery sheaths at base; native alpine perennials ..... 6. *M. alpestris.*

Plants not densely tufted; stems without papery basal sheaths; annual or biennial plants of low altitudes.
Calyx very unequally cleft, usually distinctly 2-lipped; corolla inconspicuous, 1–2 mm. broad, white; native.....7. *M. virginica.*
Calyx about equally cleft, regular or nearly so; corolla inconspicuous to showy, 1.5–8 mm. broad; usually blue; introduced plants.
Corolla very conspicuous, 5–8 mm. broad; limb flat. 8. *M. sylvatica.*
Corolla small, 1.5–4 mm. broad; limb concave.
Pedicels equalling or exceeding length of calyx; calyx-lobes spreading.....9. *M. arvensis.*
Pedicels shorter than length of fruiting calyx; calyx-lobes erect.
Plant floriferous to near base, lower flowers among the leaves; corolla blue, tube about equalling calyx; style always shorter than nutlets.....10. *M. micrantha.*
Plant not floriferous to near base, flowers in naked racemes above the leaves; corolla at first yellow finally changing to blue, tube somewhat exceeding calyx; style frequently much surpassing nutlets....11. *M. versicolor.*

1. **Myosotis albiflora** Banks & Solander in Hook. f. Fl. Antaret. ii. 329 (1846). *Eritrichium albiflorum* Griseb. Abhandl. Ges. Wis. Goett. vi. 131 (1857). *Allocarya albiflora* Greene, Erythea iii. 57 (1895).—Endemic to the vicinity of the Straits of Magellan. In the literature this plant has been repeatedly confused with the plant recently called *Plagiobothrys Lechleri* Johnston. My knowledge of this *Myosotis* has been largely derived from Skottsberg, Svenska Vet. Akad. Handl. lvi. pt. 5, 290, t. 23, fig. 8a, c (1916), who besides discussing it has given figures and a new description.

2. **M. antarctica** Hook. f. Fl. Antaret. i. 57, t. 38 (1844). *M. antarctica*, forma *gracilior* Skotts. Svenska Vet. Akad. Handl. lvi. pt. 5, 291 (1916).—Extreme southern Patagonia; also in New Zealand and on the Stewart and Campbell Islands. The species has been confused with *M. albiflora*. Skottsberg, l. c., t. 23, fig. 8b, d, gives a few figures and a new description of the species.

3. **M. scorpioides** L. Sp. Pl. 131 (1753); Rendle & Brit. Jour. Bot. xlv. 440 (1907). *M. scorpioides*, var. *palustris* L. l. c. *M. palustris* Lam. Fl. Fr. ii. 283 (1778).—Native of Europe. Frequently cultivated. Naturalized in Newf.!, Que.!, N. S.!, Me.!, N. H.!, Vt.!, Mass.!, R. I., Conn.!, N. Y.!, N. J., Penn., Md.!, D. C., Ga., Mich.!, Tenn.!, La., Ont.!, Calif.!, B. C., Hidalgo.

4. **M. laxa** Lehm. Asperif. i. 83 (1818). *M. caespitosa*, var. *laxa* A. DC. Prodr. x. 105 (1846). *M. palustris*, var. *laxa* Gray, Manual

ed. 5, 365 (1867). *M. lingulata* Lehm. Asperif. i. 110 (1818). *M. caespitosa* Schultz, Fl. Starg. Suppl. i. 11 (1819). *M. palustris*, var. *micrantha* Lehm. in Hook. Fl. Bor. Am. ii. 81 (1838).—Newfoundland to Georgia, westward to Ontario and Tennessee; also on the Pacific Coast from California to British Columbia. Chile.

5. **M. azorica** H. C. Wats. Bot. Mag. lxx. t. 4122 (Nov. 1844). (?) *M. maritima* Hochst. in Seubert. Fl. Azor. 37 (1844).—AMERICA: Mill Valley, California, 1913, *Suksdorf 520* (G); Bogotá, Colombia, 1876, *Bayon* (US); canyon of La Paz River, Bolivia, *Shepard 174* (G); Valdivia, Chile, 1896, *Buchtien* (US).—Native of the Azores and Canary Islands. Cultivated in America and occasionally escaping. I have not examined any indubitable material of *M. maritima*, but Watson's note, Lond. Jour. Bot. vi. 388 (1847), would seem to indicate that *M. azorica* and *M. maritima* merely represent ecological phases of one species. The preface of Seubert's Flora Azorica is dated April 1844, and it hence seems probable that the name *M. maritima* has priority over *M. azorica*. However, due to my lack of precise knowledge of *M. maritima* I am treating the present species under the well understood name given by Watson. In Petard & Proust's flora of the Canaries, pg. 274, as well as in Bornmüller's list, Engler, Bot. Jahrb. xxxiii. 466 (1903), the present species is treated as *M. macrocalycina* Coss. *Myosotis macrocalycina* Coss., Batt. & Trab. Fl. Alg. i. 604 (1888–90), is a very closely related plant of northern Algeria, which has the pubescence and habit of *M. azorica* and appears to differ only in its slightly longer fruiting pedicels and larger fruiting calyces. It seems not at all improbable that *M. azorica* may have still earlier synonyms in *M. latifolia* Poir. Encyc. Suppl. iv. 45 (1816), or *M. oblongata* Link in Buch, Phys. Beschr. Can. Isl. 144 (1825). The original descriptions of these latter species are so brief as to be indefinite and a study of the types must precede an attempt at precisely settling their status. Both came from the Canary Islands.

6. **M. alpestris** Schmidt, Fl. Boehm. iii. 26 (1794); Schinz & Thell. Vierteljahrs. Naturf. Ges. Zürich lxviii. 469 (1923). *M. sylvatica*, var. *alpestris* Koch, Syn. Deutsch. Fl. 504 (1838). *M. pyrenaica*, var. *alpestris* Schinz & Thell. Vierteljahrs. Naturf. Ges. Zürich liii. 558 (1908). *M. olympica* Boiss. Diagn. ser. 1, pt. 4, 50 (1844). *M. rupicola* Smith, Eng. Bot. xxxvi. t. 2559 (1814).—Arctic-alpine situations from Alaska and the lower Mackenzie River Valley, southward along the Rocky Mountains to Colorado and Oregon (acc. Howell); also in the higher mountains of Europe. Many writers consider this plant to be only a phase of *M. sylvatica*, but in the

American and European material available it seems quite distinct in its very densely tufted, very scaly, perennial base, and arctic-alpine range. The garden plants current as *M. alpestris* are horticultural forms of *M. sylvatica.*

7. **M. virginica** (L.) BSP. Prel. Cat. N. Y. 37 (1888). *Lycopsis virginica* L. Sp. Pl. 139 (1753). *M. verna* Nutt. Gen. ii. add. (1818). *M. macrosperma* Engelm. Am. Jour. Sci. ser. 1, xlvi. 98 (1844). *M. verna*, var. *macrosperma* Chap. Fl. South. U. S. 333 (1860). *M. virginica*, var. *macrosperma* Fernald, Rhodora x. 55 (1908). *M. inflexa* Engelm. l. c.—Maine to Florida, west to Ontario and Texas; reappearing in Idaho, Oregon, Washington, and British Columbia. In the South and West the plants tend to grow more rankly and to have the fruiting calyces over, rather than under 5 mm. in length; this coarser plant is the var. *macrosperma.*

8. **M. sylvatica** Hoffm. Deutsch. Fl. ed. 1, 61 (1791).—Native of Europe. This is the common forget-me-not of the garden of which there are a number of horticultural strains. It frequently escapes, as for instance in Newf.!, Que.!, N. H.!, Vt.!, Mass.!, Mich.!, and Calif.!

9. **M. arvensis** (L.) Hill, Veg. Syst. vii. 55 (1764); Schinz & Thell. Bull. Herb. Boiss. ser. 2, vii. 339 (1907). *M. scorpioides*, var. *arvensis* L. Sp. Pl. 131 (1753). *M. intermedia* Link in Schultz, Fl. Starg. suppl. i. 12 (1819).—Native of Europe. Introduced in Newf.!, Que.!, N. B.!, N. S.!, Me.!, Vt.!, Mass.!, R. I.!, Conn.!, N. Y.!, Ohio!, Ore.!, B. C.

10. **M. micrantha** Pall. in Lehm. Neue Schr. Naturf. Ges. Halle iii. pt. 2, 24 (1817); Schinz & Thell. Bull. Herb. Boiss. ser. 2, vii. 339 (1907). *M. arenaria* Schrader in Schultz, Fl. Starg. suppl. i. 12 (1819). *M. stricta* Link in R. & S. Syst. iv. 104 (1819).—Native of Europe. Introduced in N. H.!, Mass.!, N. Y.!, N. J.!, Ohio!, Ind.!, Ont.!

11. **M. versicolor** (Pers.) Smith, Eng. Bot. xxxvi. sub. t. 2558 (1814); l. c. vii. t. 480, fig. 1 (1798). *M. arvensis*, var. *versicolor* Pers. Synop. i. 156 (1805). *Anchusa lutea* Cav. Icones i. 50, t. 69, fig. 1 (1791), excl. syn. (?) *M. lutea* Pers. l. c., not Lam. (1778); Schinz & Thell. Bull. Herb. Boiss. ser. 2, vii. 338 (1907); Rendle & Brit. Jour. Bot. xlv. 440 (1907).—Native of Europe. Introduced in Que.?, Mass.!, Del.!, Ore.!, B. C.

12. **M.** sp. indet.—There is a specimen in the Gray Herbarium collected July 2, 1912 by C. K. Dodge in partially shaded high ground on Mackinac Island, Port Huron, Mich., which in gross aspect suggests *M. sylvatica*, but has white corollas with concave limb 3–5 mm. broad, and leaves rather sharply acute. It also suggests *M. virginica*

but differs in its large corollas, long spreading pedicels, and more loosely branched slender stems. More material of this form is desired and particularly information as to whether it be a native or escaped garden plant. The plant appears to be an undescribed species, but to describe it upon the data available seems entirely inadvisable.

20. **Cerinthe** [Tourn.] L. Sp. Pl. 136 (1753); Gen. Pl. 66 (1754).

Cerinthe major L. Sp. Pl. 136 (1753).—Native of the Mediterranean region. Occasionally cultivated. Found escaping from a garden in Quebec by A. S. Pease in 1904.

21. **Asperugo** [Tourn.] L. Sp. Pl. 138 (1753); Gen. Pl. 67 (1754).

Asperugo procumbens L. Sp. Pl. 138 (1753).—Native of Eurasia. An infrequent introduction. Known from Mass.!, N. Y., N. J.!, Penna.!, Del.!, D. C.!, Ohio, Minn., Alb., Utah!, Ore.!, Wash., B. C.

22. **Amsinckia** Lehm. Delect. Sem. Hort. Hamburg 7 (1831).

Benthamia Lindl. Nat. Syst. 241 (1830).—A review of the Amsinckias north of Mexico has been published by Macbride, Contr. Gray Herb. n. s. xlix. 1–16 (1917). The genus consists of three very pronounced series. Of these Macbride has succeeded in giving a satisfying elucidation of the two with lustrous and tessellate nutlets. The third and largest series, that with dull rugose nutlets, deserves further study though from its exceptional and baffling complexity there seems little hope that students can ever arrive at agreement regarding its treatment. The South American species of *Amsinckia* belong to the last section and need careful study. Superficially, however, the southern plants belong to a single species, the bibliography of which is as follows.—AMSINCKIA ANGUSTIFOLIA Lehm. Delect. Sem. Hort. Hamburg 7 (1831); Bettfr. Fl. Argent. iii. 177, t. 108 (1901). *Benthamia angustifolia* Druce, List Brit. Pl. 103 (1908). *Lithospermum calycinum* Moris, Mem. Acad. Torino xxxvii. 98, t. 22 (1833). *L. chilense* Colla, Mem. Acad. Torino xxxviii. 127 (1834). *A. parviflora* Bernh. Del. Sem. Hort. Erf. (1833). *A. angustifolia*, var. *pseudolycopsioides* Colla in Gay, Fl. Chile iv. 473 (1849). *A. pseudolycopsioides* Speg. Anal. Soc. Cient. Argent. liii. 137 (1902). *A. basistaminea* Cesati, Atti Acc. Sc. Nap. ser. 5, vii. 14 (1873). *B. basistaminea* Druce, Rep. Exch. Cl. Brit. Isl. iv. 298 (1916). *Eritrichium Mandonii* Ball, Jour. Linn. Soc. Bot. xxii. 51 (1885).

There is a species of doubtful status reported from Mexico. This

is *A. mexicana* Mart. & Gal. Bull. Acad. Brux. xi. 339 (1844), which is said to have come from near Morelia, Michoacan. I have seen no specimens of the species nor of any other *Amsinckia* coming from central or southern Mexico, nor is there, according to Mr. Paul C. Standley, any material of *Amsinckia* in the United States National Herbarium coming from that region. The plant is described as having corollas plicate in the throat which suggests that it may prove to be a *Heliotropium*.

23. **Selkirkia** Hemsley, Bot. Challenger i. pt. 3, 47 (1884).

Selkirkia Berteri (Colla) Hemsley, Bot. Challenger i. pt. 3, 48, t. 57 (1884); Brand, Pflanzenr. iv. Fam. 252, i. 16 and 163 (1921); Skottsberg, Nat. Hist. Juan Fernandez ii. 163 (1921). *Cynoglossum Berteri* Colla, Mem. Acad. Torino xxxviii. 132, t. 43 (1834).—A shrub endemic to Masatierra of the Juan Fernandez Islands. The genus is monotypic and very distinct, appearing to be most related to *Hackelia*.

24. **Cryptantha** Lehm. in F. & M. Ind. Sem. Hort. Petrop. ii. 35 (1835).

Krynitzkia F. & M. l. c. vii. 52 (1841). *Piptocalyx* Torr. in Wats. Bot. King Exped. 240 (1871), not Oliver (1870); Johnston, Contr. Gray Herb. n. s. lxviii. 55 (1923). *Eremocarya* Greene, Pittonia i. 58 (1887); Johnston, l. c. 56. *Greenocharis* Gürke & Harms in E. & P. Nat. Pflanzenf., Gesamtreg. 462 (1899). *Wheelerella* Grant, Bull. So. Calif. Acad. v. 28 (1906).—This is the largest and most difficult genus among the American members of the subfamily. It is restricted to America and has two definite centers, one in western United States and the other in middle and northern Chile. A critical descriptive monograph of the North American species is in preparation. The South American species, all different from those north of the Equator, are in distressing need of attention, but their satisfactory elucidation must await the attention of the student who can study them in the field and have access to Philippi's types at Santiago, Chile. Reiche, Fl. Chile v. 217–236 (1910), has given most of the bibliography and a rough classification of the very numerous Chilian species. The treatment while difficult of use is nevertheless very valuable in showing the probable status and relationships of most of Philippi's briefly described species. The following species from Peru appear never to have been properly named under *Cryptantha*.

Cryptantha limensis (A. DC.), comb. nov., based on *Eritrichium limense* A. DC., Prodr. x. 133 (1846), had its type collected at Lima, Peru. This has oblong obtuse leaves, leafy spikes, coarsely hirsute calyx-lobes, and inconspicuous tubular corollas. *Cryptantha granulosa* (R. & P.) Johnston is the only other member of the genus described from Peru, although material recently received from that country seems to contain several additional species, all undescribed.

25. **Oreocarya** Greene, Pittonia i. 57 (1887).

This group has been recently revised by Macbride, Contr. Gray Herb. xlviii. 20–38 (1916). It may be strongly questioned whether it is generically distinct from *Cryptantha*, particularly so when the South American members of the latter genus are considered. No one has yet pointed out characters for *Oreocarya* which are consistently diagnostic, nor has a rather superficial search on my part resulted in the discovery of any. The group is maintained here as a genus pending detailed studies to be reported on later.

26. **Plagiobothrys** F. & M. Ind. Sem. Hort. Petrop. ii. 46 (1835).

Echidiocarya Gray, Proc. Am. Acad. xi. 89 (1876). *Sonnea* Greene, Pittonia i. 22 (1887). *Allocarya* Greene, Pittonia i. 12 (1887).—For a synopsis of this genus see Johnston, Contr. Gray Herb. n. s. lxviii. 57–80 (1923).

27. **Mertensia** Roth, Cat. Bot. i. 34 (1797).

Pneumaria Hill, Veg. Syst. vii. 40 (1764).—Macbride, Contr. Gray Herb. n. s. xlviii. 1–20 (1916), has recently revised the true Mertensias of western America. Bibliography and descriptions of the relatively few species left untreated by Macbride may be found by consulting Gray, Synop. Fl. N. Am. ii. pt. 1, 199–201 (1878), and Britton & Brown, Illust. Fl. ed. 2, iii. 82–83 (1913). In the past the genus has been almost always referred to the tribe *Lithospermeae*, but the attachment of its nutlets and its simple stigma clearly point to a relationship among the *Eritrichieae*. Suggestive also of this latter relationship is the consistently boreal distribution, the *Lithospermeae* being a prevailingly austral group.

28. **Trigonotis** Stev. Bull. Soc. Nat. Moscou xxiv. 603 (1851).

Trigonotis peduncularis (Trev.) Benth. Jour. Linn. Soc. xvii. 384 (1879). *Myosotis peduncularis* Trev. Mag. Ges. Nat. Fr. Berlin vii. 147, t. 2, fig. 6–9 (1816). *Eritrichium pedunculare* A. DC. Prodr. x. 128 (1846).—Native from extreme southeastern Europe through middle and northern China to Japan. Although apparently hereto-

fore unreported from America, this species was collected July 12, 1893 in the vicinity of Nanaimo, Victoria Island, British Columbia, by John Macoun (no. *694*) and distributed as *Myosotis arvensis*. It is a roadside weed in Asia and probably introduced in America in ballast.

29. **Lappula** Moench, Meth. 416 (1794).

Echinospermum Sw. in Lehm. Asperif. i. 113 (1818). *Staurina* Nutt. Jour. Acad. Philad. i. 182 (1848)

KEY TO SPECIES AND VARIETIES.

Nutlets with marginal prickles in at least two rows.
Fruit in situ ca. 3 mm. high; nutlets with dorsal granulations uniform; introduced plants ..... 1. *L. echinata.*
Fruit in situ 4–5 mm. high; nutlets with dorsal granulations high towards middle and low towards sides; plants native of western United States.
Plant suffruticose, bushy-branched, green; pubescence short, appressed, sparse; fruit in situ ca. 5 mm. high ... 2. *L. cenchrusoides.*
Plant entirely herbaceous, usually branched above and strict, canescent; pubescence rather long and loose; fruit in situ ca. 4 mm. high ..... 3. *L. Fremontii.*
Nutlets with marginal prickles definitely in a single row.
Marginal prickles distinct to base or nearly so, not confluent to form a cupulate structure.
Style exceeded by nutlets; margin of nutlets unarmed or with short obscure glochids ..... 4. *L. brachystyla.*
Style surpassing nutlets; margin of nutlets with conspicuous well developed prickles ..... 5. *L. Redowskii.*
Tubercules on nutlets numerous, not in regular longitudinal rows; native of western America ..... var. *occidentalis.*
Tubercules on nutlets few, arranged in regular longitudinal rows; ballast plants native of Eurasia ..... var. *patula.*
Marginal prickles confluent, forming a conspicuous cupulate structure on back of some or all the nutlets ..... 6. *L. texana.*
Nutlets heteromorphous, one or two with distinct prickles and not with a cupulate margin.
Plant erect, branched above, tall ..... var. *genuina.*
Plant decumbent or ascending, branched at base, low. var. *heterosperma.*
Nutlets homomorphous, all with confluent prickles and hence a cupulate margin.
Cupulate margin narrow, spreading.
Plant branched above; pubescence villous ..... var. *columbiana.*
Plant branched at base; pubescence harsh ..... var. *foliosa.*
Cupulate margin deep, inflexed.
Anterior parts of nutlets tuberculate ..... var. *homosperma.*
Anterior parts of nutlets smooth ..... var. *coronata.*

1. **Lappula echinata** Gilib. Fl. Lith. i. 25 (1781). *Myosotis Lappula* L. Sp. Pl. 131 (1753). *Echinospermum Lappula* Lehm. Asperif. i. 121 (1818). *L. Lappula* Karst. Deutsch. Fl. 979 (1880–83).—Native of Eurasia. Introduced in Newf.!, Que.!, P. E. I.!, N. B.!, N. S.!,

Me.!, N. H.!, Vt.!, Mass.!, R. I., Conn.!, N. Y.!, N. J.!, Penn., Ont.!, Ind.!, Mich.!, Wis.!, Ill.!, Minn.!, Mo.!, N. D.!, S. D.!, Neb.!, Kan., Tex., Alb.!, Calif., B. C.!, Alaska!

2. **L. cenchrusoides** Nels. Bull. Torr. Bot. Cl. xxvi. 243 (1899); Nels. & Macbr. Bot. Gaz. lxi. 38 (1916).—A local species known only from southeastern Wyoming. Characterized by its habit and very large fruit.

3. **L. Fremontii** (Torr.) Greene, Pittonia iv. 96 (1899); Nels. & Macbr. Bot. Gaz. lxi. 37 (1916). *Echinospermum Fremontii* Torr. Pacif. R. R. Rep. xii. pt. 2, 46 (1860). *L. erecta* Nels. Bull. Torr. Bot. Cl. xxvii. 268 (1900).—Assiniboia to Wyoming, Utah, and Idaho. As here used the binomial covers the plant originally described, namely Suckley's collection from the "Upper Missouri River." The collection made by Fremont, which was originally cited and from which the species apparently got its name, is probably *L. Redowskii*, var. *occidentalis* inasmuch as the specimen is given as having come from the southern Sierra Nevada where only the latter species is known to occur. There are hence good reasons for considering the Fremont collection as the type of *L. Fremontii* and for referring the species to synonymy under the variety of *L. Redowskii*. Indeed I should be inclined to do this were the status of the alternate name, *L. erecta*, an unclouded one. Nelson & Macbride, l. c., say "*L. erecta* is clearly a synonym" of *L. Fremontii* as here accepted, yet in the original description of the former the nutlets are described as having "a single marginal series of about 10 aculeae," whereas the plant concerned has numerous aculeae in several series.

4. **L. brachystyla** (Gray) Macbr. Contr. Gray Herb. n. s. xlviii. 40 (1916). *Echinospermum brachycentrum*, var. *brachystylum* Gray, Proc. Am. Acad. xxi. 413 (1886).—Known only from the type collected in 1885 at Spence's Bridge, Thompson River, in southern British Columbia. The species is very distinct among the American representatives of the genus.

5a. **L. Redowskii** (Hornem.) Greene, var. **occidentalis** (Wats.) Rydb. Contr. U. S. Nat. Herb. iii. 170 (1895); Nels. & Macbr. Bot. Gaz. lxi. 38 (1916). *Echinospermum Redowskii*, var. *occidentale* Wats. Bot. King Exped. 246, t. 23, fig. 9–10 (1871). *L. occidentalis* Greene, Pittonia iv. 97 (1899). *Cynoglossum pilosum* of Nutt. Gen. i. 114 (1818); not R. & P. (1799); T. & G. Pacif. R. R. Rep. ii. 171 (1855) and Nutt. Jour. Acad. Philad. i. 182 (1848). *L. Redowskii*, var. *pilosum* MacMill. Metasp. Minn. Valley 441 (1892). *L. pilosa* Hitchc. Spr. Fl. Manhattan 30 (1894). *C. Nuttallii* Spreng. Syst. i.

566 (1825). *Pectocarya lateriflora*, var. *Nuttallii* Brand, Pflanzenr. iv. Fam. 252, i. 95 (1921), name only. *E. strictum* Nees in App. Neuwied, Trav. 17 (1841), not Ledeb. (1829). *E. Redowskii*, var. *strictum* Wats. l. c. 247, name only. (?) *E. pilosum* Buckl. Proc. Acad. Philad. 1861, 462 (1861). (?) *L. montana* Greene, Pittonia iv. 96 (1899). *L. calycosa* Rydb. Bull. Torr. Bot. Cl. xxviii. 30 (1901). *E. patagonicum* Speg. Anal. Soc. Cient. Argentina liii. 79 (1902). *L. patagonica* Druce, Rep. Bot. Exch. Cl. Brit. Isl. iv. 630 (1917). *L. leucotricha* Rydb. Bull. Torr. Bot. Cl. xxxvi. 676 (1909).—Native of Asia and America. In the New World occurring in Patagonia and from Saskatchewan, North Dakota, Oklahoma, and New Mexico westward. Extending northward to Alaska. In United States introduced east of its natural range in Me.!, Mass.!, Mich.!, Wis.!, Minn.!, and Mo.!

5b. **L. Redowskii**, var. **patula** (Lehm.) Nels. & Macbr. Bot. Gaz. lxi. 39 (1916). *Echinospermum patulum* Lehm. Asperif. i. 124 (1818). —Native of southeastern Europe and adjacent Asia. Occasional in America as a ballast plant, and known from Penn.!, and Ore.! I am not thoroughly satisfied that this introduced plant can always be separated from indigenous material by the characters given in the key.

6a. **L. texana**, var. **genuina**. *L. texana* (Scheele) Britt. Mem. Torr. Bot. Cl. v. 273 (1894); Nels. & Macbr. Bot. Gaz. lxi. 40 (1916). *Echinospermum texanum* Scheele, Linnaea xxv. 260 (1852). *E. Redowskii*, var. *cupulatum* Gray, Bot. Calif. i. 530 (1876). *L. cupulata* Rydb. Bull. Torr. Bot. Cl. xxviii. 31 (1901). *E. cupulatum* K. Schum. in Just, Jahresb. xxix. pt. 1, 564 (1903). *L. Redowskii*, var. *cupulatum* Jones, Bull. Univ. Montana xv. 44 (1910). *E. scabrosum* Buckl. Proc. Acad. Philad. 1861, 462 (1861).—This, the typical form of the species, is most common and apparently centers in Texas, and from there extends northward through Kansas to North Dakota, and southward into Coahuila. A discussion of the application of the name *L. cupulatum* will be found under *L. texana*, var. *columbiana*. In desperation I refer two puzzling collections to the present variety; these are *Goodding 1010* from Modena, Utah, and *Macbride & Payson 948* from the Grand Canyon, Arizona. Most of the fruits on these collections have heteromorphous nutlets and most of the latter have conspicuous margins which are high about the base of the nutlets and very low or absent about the tip. Confusing is the fact that the later fruit produced by these plants appears to be practically homomorphous and quite like that produced in *L. Redowskii*, var. *occidentalis*. It becomes a question, therefore, as to what should be done with the

collections and just how they affect the validity of *L. texana*. The status of that species having previously been none too satisfactory these collections have made me strongly consider reducing it to varietal rank under *L. Redowskii*. Since, however, the specimens may be abnormal or possibly of hybrid origin, pending the receipt of new data or specimens, I am for the present offering no solution of the problem and am not considering the matter in relation to the distinctness of *L. Redowskii* and *L. texana*.

6b. **L. texana**, var. **heterosperma** (Greene) Nels. & Macbr. Bot. Gaz. lxi. 41 (1916). *L. heterosperma* Greene Pittonia iv. 94 (1899). (?) *L. desertorum* Greene, l. c. 95. *L. cucullata* Nels. Bot. Gaz. xxxiv. 29 (1902)—Western and middle southern Colorado northward to western Wyoming. Readily distinguished from var. *genuina* by its low bushy habit and different range.

6c. **L. texana**, var. **columbiana** (Nels.), comb. nov. *L. columbiana* Nels. Bot. Gaz. xxxiv. 28 (1902). *L. infelix* Greene, Pittonia iv. 235 (1901). (?) *L. anoplocarpa* Greene, Ottawa Nat. xvi. 39 (1902). *L. cupulata* of Nels. & Macbr. Bot. Gaz. lxi. 39 (1916), and most authors.—Washington, northern Idaho, and northern Oregon. This plant has the habit of var. *genuina*, but has different nutlets and a widely different range. Most authors have maintained it as a distinct species, but it seems to intergrade with the var. *homosperma* through the var. *foliosa*. Nelson & Macbride, l. c., Piper, Contr. U. S. Nat. Herb. xi. 475 (1906), and Rydberg, Fl. Rocky Mts. 717 (1917), have treated the present plant as *L. cupulata*, typifying it by the specimen from Trinity Mountains, Nevada, cited by Watson, Bot. King Exped. 247 (1871), under "*Echinospermum Redowskii*, var. *strictum*." It is not clear why *L. cupulatum* has been so typified. The plant treated by Watson is what is here called *L. texana*, var. *columbiana*, but Watson's trinomial, *E. Redowskii*, var. *strictum*, is evidently based upon *E. strictum* Nees, Append. Neuwied, Trav. 17 (1841), which originally came from the upper Missouri River and appears to be *L. Redowskii*, var. *occidentalis*. In the Botany of California, i. 530 (1876), Gray proposed a new trinomial, *E. Redowskii*, var. *cupulatum*, apparently because Nees's binomial was antedated by one of Ledebour's. Under the new name Gray cited Watson's trinomial and Nees's binomial, clearly showing thereby that he considered them synonymous. Gray's description and the meaning of his varietal name, however, clearly apply to a plant different from that properly covered by the names he cites. When the variety was proposed Gray had six, or possibly seven, specimens that he referred to it. Of this suite three, or possibly four

specimens, are *L. texana*, var. *genuina*, one is *L. texana*, var. *heterosperma*, one is *L. texana*, var. *foliosa*, and one is the plant here called *L. texana*, var. *columbiana*. It hence appears that *E. Redowskii*, var. *cupulatum* Gray is best treated, not as synonymous with *E. strictum* Nees (and consequently a synonym of *L. Redowskii*, var. *occidentalis*), but as synonymous with *L. texana*, var. *genuina* which includes the bulk of the original material cited by Gray and which is most appropriately covered by his varietal name.

6d. **L. texana**, var. **foliosa** (Nels.), comb. nov. *L. desertorum*, var. *oliosa* Nels. Bull. Torr. Bot. Cl. xxvii. 267 (1900). *L. foliosa* Nels. Man. Rocky Mt. Bot. 413 (1909). *L. cupulata*, var. *foliosa* Nels. & Macbr. Bot. Gaz. lxi. 40 (1916).—Plains of southern Idaho and adjacent Wyoming and Oregon.

6e. **L. texana**, var. **homosperma** (Nels.) Nels. & Macbr. Bot. Gaz. lxi. 41 (1916). *L. heterosperma*, var. *homosperma* Nels. Bot. Gaz. xxxiv. 29 (1902). (?) *L. montana* Greene, Pittonia iv. 96 (1899).—Alberta southward to Colorado.

6f. **L. texana**, var. **coronata** (Greene) Nels. & Macbr. Bot. Gaz. lxi. 41 (1916). *L. coronata* Greene, Pittonia iv. 94 (1899).—Southern Arizona.

30. **Eritrichium** Schrad. in Gaud. Fl. Helv. ii. 57 (1828).

Eritrichum Schrad. Comm. Goett. iv. 186 (1820), hyponym.

Key to Species and Varieties

Plant closely strigose; pubescence of leaves not projecting beyond apex as a conspicuous tuft; corolla 7–13 mm. broad.
  Nutlets bordered with jagged teeth; plant green, with a rather sparse pubescence; Alaska and Yukon Territory.....1. *E. splendens.*
  Nutlets bordered with a low unarmed rim; plant canescent, with a dense pubescence; Montana to Washington....2. *E. Howardi.*
Plant loosely villous; pubescence on leaves projecting beyond apex as a conspicuous tuft; corolla 1–7 mm. broad.
  Margin of nutlets with very elongate teeth, the latter about equalling length of body of nutlet; arctic.....3. *E. arctioides.*
  Margin of nutlets even, or with teeth much shorter than body of nutlet; montane.
    Dorsal margin of nutlet even.....4. *E. elongatum.*
    Dorsal margin of nutlet toothed.....var. *argenteum.*

1. **Eritrichium splendens** Kearney in Wight, Bull. Torr. Bot. Cl. xxix. 410, fig. C (1902).—Alaska: Old Man Creek, 1901, *Mendenhall* (type, US). Yukon: long. 141° lat. 62° 5′, alt. 1800 m., *Cairnes 85868* (G).—A very distinct species which in habit suggests the species related to *E. rupestris* (Pall.) Bunge. It is known only from Alaska and adjacent Yukon.

2. **E. Howardi** (Gray) Rydb. Mem. N. Y. Bot. Gard. i. 327 (1900). *Cynoglossum Howardi* Gray, Synop. Fl. N. Am. ii. pt. 1, 188 (1878). *Omphalodes Howardi* Gray, l. c. 423 (1886).—The collections cited by Wight, Bull. Torr. Bot. Cl. xxix. 410 (1902), and by Rydberg, l. c., in addition to that preserved in the Gray Herbarium, shows the species to center on the eastern slope of the cordilleras in western Montana. It extends southward, according to Dr. Rydberg *in lit.*, at least to the east slope of the Big Horn Mts. in northern Wyoming. The species is reported from the Cascade Mts. upon the basis of a collection by Tweedy, but its occurrence in western Washington seems incongruous with its indubitable range, and perhaps Tweedy's specimen was attributed to the Cascades through mislabeling.

3. **E. aretioides** (Cham.) A. DC. Prodr. x. 125 (1846); Kurtz, Engler Bot. Jahrb. xix. 471 (1894). *Myosotis aretioides* Cham. Linnaea iv. 443 (1829). *E. nanum*, var. *aretioides* Herder, Act. Hort. Petrop. i. 535 (1871–72). *Omphalodes nana*, var. *aretioides* Gray, Proc. Am. Acad. xx. 263 (1885). *E. Chamissonis* A. DC. l. c. *E. nanum*, var. *Chamissonis* Herder, l. c. *O. nana*, var. *Chamissonis* Gray, l. c.—Like Macbride, Contr. Gray Herb. n. s. xlviii. 50 (1916), I am unable to maintain *E. Chamissonis* as distinct from *E. aretioides*. The differences pointed out by Wight, Bull. Torr. Bot. Cl. xxix. 408 (1902), appear to be merely ecological. The species is known only from the vicinity of Bering Sea.

4. **E. elongatum** (Rydb.) Wight, Bull. Torr. Bot. Cl. xxix. 408, fig. D (1902). *E. aretioides*, var. *elongatum* Rydb. Mem. N. Y. Bot. Gard. i. 327 (1900). *Oreocarya pulvinata* Nels. Bot. Gaz. xl. 63 (1905).—Mountains from Montana to Idaho and eastern Oregon, southward to Utah and northern New Mexico. It is uncommon in the southern part of its range being largely replaced by the var. *argenteum*. As Macbride, Contr. Gray Herb. n. s. xlviii. 50 (1916), has pointed out, *Eritrichium elongatum* is very closely related to the European *E. nanum* (All.) Schrad. The only constant difference that I can detect is that the American plant is notably more canescent than its European congener. The differences in nutlets mentioned by Macbride, I fail to find. European plants vary greatly in the development of the dorsal rimming on the nutlets and seem to duplicate all the variations of this structure produced by the American relative. It can be said that *E. nanum* has a larger and less variable corolla than *E. elongatum*. On Pikes Peak, Colorado, the latter species is abundant on the alpine sward and shows a complete lack of

constancy in corolla-size, the corolla varying from 1–6 mm. in breadth without any particular size predominating.

4a. **E. elongatum**, var. **argenteum** (Wight), comb. nov. *E. argenteum* Wight, Bull. Torr. Bot. Cl. xxix. 411, fig. F (1902).—Most abundant in the mountains of Colorado, particularly in the southern part. It differs from the typical phase of the species only in having the margin of its nutlets jaggedly toothed.

31. **Hackelia** Opiz in Bercht. Fl. Boehm. ii. pt. 2, 146 (1839).

The bibliography and status of this genus was recently reviewed by Johnston, Contr. Gray Herb. n. s. lxviii. 43–48 (1923). Descriptions and keys for most of the species may be found in the basic paper by Piper, Bull. Torr. Bot. Cl. xxix. 535–549 (1902).

Excluded and unidentified names.

Anchusa depressa Sesse & Moc. Pl. N. Hisp. 21 (1887).—"Habitat in Uruapam" [Michoacan, Mexico].= Heliotropium limbatum Benth.

Anchusa incana Sesse & Moc. Fl. Mex. 30 (1894).—"Nascitur Quauhnahuacae agris" [(?) Cuernavaca, Morelos, Mexico]. Identity wholly obscure.

Antiphytum mexicanum DC. Prodr. x. 121 (1846).—"In Mexico in Chilpansigi circuitibus" [Guerrero, Mexico]. = Heliotropium calcicola Fernald.

Batschia albiflora Raf. New Fl. N. Am. pt. 4, 19 (1836).—"On the River Arkanzas on sand bars." = *Euploca convolvulacea* Nutt. (1837), and should therefore bear the name **Euploca albiflora** (Raf.), comb. nov.

Cerinthe lanceolata Sesse & Moc. Pl. N. Hisp. 20 (1887).—"Habitat Quahunahuacae" [(?) Cuernavaca, Morelos, Mexico]. This has a synonym in *Heliotropium lancifolium* Sesse & Moc. (1894), but both species are quite obscure.

Eritrichium pampeanum Speg. Fl. Ventana 44 (1896).—Sierra de la Ventana, prov. of Buenos Aires, Argentina. Spegazzini, Rev. Fac. Agron. et Veternar. iii. 551 (1897), says regarding *E. albiflorum* (B. & S.) Griseb. (= *Plagiobothrys Lechleri* Johnston), "species habitu *E. pampeano* Speg. sat. similis atque valde affinis." *Eritrichium pampeanum* is described as having subtrigonous smooth shiny nutlets that are completely bordered by an entire coriaceous-membranous ridge or crest. I know of no *Plagiobothrys* with such nutlets and suspect that Spegazzini's plant is a *Cryptantha*.

Lithospermum aggregatum R. & P. Fl. Peruv. ii. 4 (1799).—"Habitat in collibus aridis Tarmae et Huanuci" [Peru]. = COLDENIA PARONYCHIOIDES Phil.

Lithospermum angustifolium Sesse & Moc. Fl. Mex. 29 (1894); not Michx. (1803).—"Habitat in Oppido Ario" [Michoacan, Mexico]. This species has an earlier synonym in L. ROSMARINIFOLIUM Sesse & Moc. (1887); not Tenore (1826), but neither species has been recognized.

LITHOSPERMUM CILIATUM Raf. New Fl. N. Am. pt. 4, 18 (1836).—"Found by Hart on the Red River and by Drummond in Texas." Unrecognized but probably belonging in *Lithospermum* or *Oreocarya*.

Lithospermum cuneifolium Pers. Synop. i. 158 (1805). Based upon L. INCANUM R. & P. (1799).

LITHOSPERMUM CUSPIDATUM Raf. New Fl. N. Am. pt. 4, 18 (1836).—"In Alabama and Georgia." The identity of this species is wholly obscure.

Lithospermum dichotomum R. & P. Fl. Peruv. ii. 5, t. 111c (1799).—"Habitat Peruviae arenosis, versus Lurin, prope castrum Pachacamac." = COLDENIA DICHOTOMA (R. & P.) Lehm.

LITHOSPERMUM FLORIDANUM Raf. New Fl. N. Am. pt. 4, 18 (1836).—"In Florida." Seeds said to be pilose, and hence perhaps a *Heliotropium*.

LITHOSPERMUM FLAVUM Sesse & Moc. Fl. Mex. 30 (1894).—"Habitat in montibus *Zitácuáro* inter et *Malacatepec* interjectis" [Michoacan, Mexico]. Wholly obscure.

Lithospermum gracile Raf. New Fl. N. Am. pt. 4, 17 (1836).—"Sent me from Alabama and found on Red River Arkansas and Texas." = HELIOTROPIUM TENELLUM (Nutt.) Torr.

LITHOSPERMUM INCANUM R. & P. Fl. Peruv. ii. 4 (1799).—"Habitat in Peruviae collibus aridis versus Tarmae oppidum." Probably a *Lithospermum* and perhaps *L. peruvianum* A. DC.

LITHOSPERMUM OBTUSIFLORUM Sesse & Moc. Fl. Mex. 29 (1894).—"Habitat in montibus Oppido de *El Valle*" [(?) state of Mexico]. Wholly obscure.

LITHOSPERMUM ROSMARINIFOLIUM Sesse & Moc. Pl. Nov. Hisp. 20 (1887); not Tenore (1826).—"Habitat in Oppido Ario" [Michoacan, Mexico]. Unrecognized.

Lithospermum tenellum Nutt. Trans. Am. Philos. Soc. ser. 2, v. 188 (1837).—"In the prairies of Red River." = HELIOTROPIUM TENELLUM (Nutt.) Torr.

LYCOPSIS AXILLARIS Raf. New Fl. N. Am. pt. 4, 19 (1836).—"Found in Florida." Identity wholly obscure.

Myosotis cymosa Nutt. in Hook. Kew Jour. Bot. iii. 294 (1851); nom. nud.

MYOSOTIS GRANDIFLORA HBK. Nov. Gen. et Sp. iii. 90, t. 199 (1818).—"Crescit in Regno Quitensi, inter Tiscan et Alausi" Ecuador. Perhaps a *Lithospermum*.

MYOSOTIS MEXICANA Sesse & Moc. Fl. Mex. 31 (1894).—"Habitat in temperatis N. Hispan. montibus." Probably *Heliotropium calcicola* Fernald.

MYOSOTIS SERICEA Nutt. in Hook. Kew Jour. Bot. iii. 295 (1851), nom. subnud.—"On the hills of the Upper Platte River." = *Oreocarya* sp.

MYOSOTIS URUGUAYENSIS Arechav. Anal. Mus. Nat. Montevid. ser. 2, i. 68, fig. 4 (1911); Fl. Urug. iv. 180, fig. 12 (1911).—Dept. of Tacuarembo, Uruguay. Unrecognized.

ONOSMODIUM ERIOCAULON A. DC. Prodr. x. 70 (1846).—"In Mexico ad Cordilleram Guchilaqua." Described from *Berlandier 1020*, material past flowering. It is probably a *Lithospermum*.

PULMONARIA CANADENSIS Yong, Cat. 44 (1783), nom. subnud.—From the Virginias and Carolinas. Probably a synonym of *Mertensia virginiana* (L.) DC.

PULMONARIA ELLIPTICA Raf. New Fl. N. Am. pt. 4, 17 (1836).—"In the Apalachian Mts. of Virginia and Carolina." Probably a synonym of *Hackelia virginiana* (L.) Johnston.

SYMPHYTUM AMERICANUM Yong, Cat. 47 (1783), nom subnud.—From the Virginias and Carolinas. Wholly obscure.

Symphitum fruticosum Sesse & Moc. Pl. N. Hisp. 21 (1887); A. DC. Prodr. x. 121 (1846).—"Habitat in frigidis Chilpanzingi montibus" [Guerrero, Mexico]. = HELIOTROPIUM CALCICOLA Fernald.

SYMPHYTUM HIRSUTUM Raf. Med. Fl. ii. 95 (1830).—"A native American species . . . , found west of the Mississippi, in prairies and glades, and cultivated at Bartram's garden." Probably *S. officinale* L. and not a native.

SYMPHYTUM MINUS Yong, Cat. 47 (1783), nom. subnud.—From the Virginias and Carolinas. Wholly obscure.

2. A TENTATIVE CLASSIFICATION OF THE SOUTH AMERICAN COLDENIAS.

The present paper has evolved from an attempt at definitely allocating certain plants described as Lithospermums by Ruiz & Pavon.

This problem has involved a study of the South American species of *Coldenia*. As these have never been treated comprehensively it is hoped that notes presented in the form of a tentative classification may be useful. Through the kindness of Dr. N. L. Britton and Dr. W. R. Maxon I have had the privilege of studying the South American material of the genus contained in the collections of the New York Botanical Garden and the United States National Herbarium, in addition to that of the Gray Herbarium. Mr. J. F. Macbride of the Field Museum of Natural History has also allowed me to study such material of the genus as he has collected in Peru. The material thus assembled is not so extensive nor so complete as desirable, more than half the collections coming from the Galapagos Islands, and the remainder containing much duplication of collections and localities. It has been consequently necessary to treat a number of species entirely upon the basis of published descriptions. In doing this I have derived much help from Reiche's treatment of the Chilian species, Fl. Chile v. 187–191 (1910), and have usually accepted his verdict on the status of Philippi's rather numerous proposals.

The genus *Coldenia* breaks up into four sections, *Eucoldenia*, *Eddya*, *Sphaerocarya*, and *Tiquiliopsis*. Of these only the last is unrepresented in South America. The sections of the genus may be distinguished as follows:—

Corolla appendaged within ..... *Tiquiliopsis*.
Corolla naked within.
  Nutlets attached at the base by a small circular areola, more or less spherical ..... *Sphaerocarya*.
  Nutlets attached ventrally, more or less elongated.
    Nutlets rather small, in situ not closely crowded, distinct, anteriorly with a medial ventral keel or groove ..... *Eddya*.
    Nutlets rather large, in situ closely juxtaposed, anteriorly plane or definitely angled with the flat faces of the adjacent nutlets closely appressed ..... *Eucoldenia*.

The section *Eucoldenia* is readily broken up into three distinct series. First, genuine *Coldenia* consisting of *C. procumbens*, a weedy annual herb of the Old World tropics, which has rugose veiny leaves, and lobed glandular-pubescent tuberculate acuminate fruit. Second, the series *Stegnocarpus* containing *C. canescens* and *C. Greggii* which is composed of suffruticose plants of the adjacent portions of United States and Mexico possessing tomentose unveined leaves, and smooth somewhat villous-strigose merely sulcate non-acuminate fruit. Third, the series *Tiquilia*, consisting of *C. dichotoma* and *C. grandiflora*, slightly shrubby plants of Peru and Chile, which have rugose veiny leaves, and glabrous finely tessellate-granulate mottled merely sulcate

non-acuminate fruit. The genus *Tiquilia* Pers. was based entirely upon *C. dichotoma*. In the past it has been incorrectly used to cover species properly referred to *Eddya* and *Tiquiliopsis*. The nutlets of *C. dichotoma* and *C. grandiflora* are large and have flat closely appressed anterior faces, quite as in the other species of the section *Eucoldenia*, in fact were all four instead of merely two opposite nutlets developed, they would not be hemispherical but quite like those in *C. canescens*.

The species of *Coldenia* on the Galapagos Islands, which was first taken as constituting a new genus and described as *Galapagoa Darwini* by the younger Hooker, is evidently a very close ally of the continental plant called *C. paronychioides*. Obviously of the same group of immediate relatives are the North American *C. hispidissima*, *C. tomentosa*, *C. mexicana*, *C. Purpusii*, and *C. cuspidata*. The seven species mentioned form so homogeneous a group that the synonymy of the genera *Eddya* and *Galapagoa* can be questioned by no one. The section to which I refer the seven species, the oldest name of which is *Coldenia* § *Eddya* Gray, is characterized by its rounded more or less ovoid not closely crowded dark roughened nutlets which are attached ventrally along a well-marked elongated ventral keel or groove.

For the three species, *C. litoralis*, *C. atacamensis*, and *C. parviflora*, I am proposing a new section which may be called, **Sphaerocarya** (TYPE, *C. litoralis* Phil.). These species have practically spherical nutlets which just touch one another and are basally attached by a small circular scar. The petioles in the species are usually without the villous-ciliations characteristic of the section *Eddya*. The species of the section *Sphaerocarya* center in northern Chile.

The final section of *Coldenia* is *Tiquiliopsis*. The group is characterized by its appendaged corollas. The fruit in the three species referred to the section is widely variable and I am not at all satisfied that the division is a natural one. In *C. Nuttallii* the nutlets are elongate-ovoid with a ventral scar quite like that in the species of the section *Eddya*. The nutlets are nearly smooth, however, and the slender petioles are not villous-ciliate. In *C. Palmeri* (= *C. brevicalyx* Wats.!) the nutlets are quite like those in the South American species of the section *Sphaerocarya*, in fact this species seems typical of the section in all but its appendaged corollas. *Coldenia plicata* (= *C. Palmeri* of authors, not Gray) has ovoid nutlets with a very short stipe-like suprabasal attachment unlike that in any other species of the genus. It perhaps finds its nearest relations in the section *Sphaerocarya*.

I have not attempted to place sectionally *C. decumbens* Hauman,

since I know it only from description and am not confident that it is properly included in *Coldenia*. If actually a member of *Coldenia* it may belong to the section *Eddya* or perhaps is worthy of special recognition.

Coldenia L. Sp. Pl. 125 (1753); Gen. Pl. 61 (1754). *Tiquilia* Pers. Synop. i. 157 (1805). *Monomesia* Raf. Fl. Tellur. iv. 87 (1836). *Galapagoa* Hook. f. Proc. Linn. Soc. i. 277 (1845); Trans. Linn. Soc. xx. 196 (1847). *Stegnocarpus* T. & G. Pacif. R. R. Rep. ii. pt. 2, 169 (1856). *Ptilocalyx* T. & G. l. c. 170. *Eddya* T. & G. l. c. 170. *Lobophyllum* F. Muell. in Hook. Kew Jour. Bot. ix. 21 (1857). *Tiquiliopsis* Heller, Muhlenbergia ii. 239 (1906).

Key to Species.

Nutlets plano-convex, 1.5–2.5 mm. long, conspicuously mottled.
  Corolla 3–4 mm. broad; stamens conspicuously exserted. . . . 1. *C. dichotoma.*
  Corolla 9 mm. broad; stamens included . . . . . 2. *C. grandiflora.*
Nutlets spherical to narrowly ovoid, not at all plano-convex, concolorous.
  Nutlets 1–2 mm. long, smooth, ovoid; plant annual; Argentina. . . . . 3. *C. decumbens.*
  Nutlets 0.5–1 mm. long, ovoid or globose, papillose or pebbled; plants perennial, becoming suffruticose towards base; Peru and Chile mainly.
    Nutlets narrowly ovoid with a narrow longitudinal ventral scar; petioles rather short, usually conspicuously villous-ciliate.
      Fruiting calyx ovoid, 1–2 mm. long, obscured by and simulating the foliage, base of lobes closely investing back of nutlets; Galapagos Islands. . . . . 4. *C. Darwini.*
      Fruiting calyx cylindrical, 2.5–3.5 mm. long, evident, lobes not closely investing back of nutlets; mainland. 5. *C. paronychioides.*
    Nutlets spherical or nearly so, with a small circular basal scar; petioles slender, usually not strikingly villous-ciliate.
      Leaf-blades ovate, acute, with 2–3 pairs of veins, about equalling petioles, margins straight; plant regularly dichotomous. . . . . 6. *C. litoralis.*
      Leaf-blades oblong, obtuse, with 4–5 pairs of veins, evidently longer than petioles, margins usually crisped; plant irregularly branched.
        Corolla 8–10 mm. long, twice length of calyx. . . . . 7. *C. atacamensis.*
        Corolla ca. 5 mm. long, about equalling calyx. . . . . 8. *C. parviflora.*

1. Coldenia dichotoma (R. & P.) Lehm. Asperif. i. 9 (1818). *Lithospermum dichotoma* R. & P. Fl. Peruv. ii. 5, t. 111c (1799). *Tiquilia dichotoma* Pers. Synop. i. 157 (1805). *C. pentandra* Juss. acc. Steud. Nomencl. ed. 1, 212 (1821). *C. Dombeyana* Juss. acc. Buek, Index iii. 108 (1858).—Known only from Peru. The type material came from sandy places towards Lurin, about 25 miles south

of Lima, and near the fort of Pachacamac. I have studied an ill-labeled specimen preserved in the Gray Herbarium, and material gathered by Macbride (no. *5946*) near Lima. From their detailed agreement with the original description and plate, the two collections are evidently typical *C. dichotoma*. These plants mature two single-seeded nutlets the backs of which are strongly convex, finely tessellate-granulate, and more or less ashy and strongly mottled with brown. The anterior face of the nutlet is flat with a small rim, and is orbicular or orbicular-ovate in outline. Four ovules are produced but only two opposite ones mature in each fruit. The peculiar hemispherical nutlets are very characteristic, but may not always be developed since it is likely that the plants, occasionally at least, produce more than two mature nutlets in a fruit. The exserted stamens are sufficient to identify the species in any case. The calyx-lobes are divided to the base.

2. C. GRANDIFLORA Phil. Cat. Pl. Itin. Tarapaca 55 (1891); Reiche, Fl. Chile v. 188 (1910).—I know this species only from descriptions. It appears to have been known to Reiche and Philippi only from the type-collection made at Médanos de Pica in the province of Tarapacá, Chile. It is evidently a close ally of *C. dichotoma*, but is clearly different in its corolla.

3. C. DECUMBENS Hauman, Apuntes Hist. Nat. Buenos Aires i. 55 (1909); Anal. Soc. Cient. Argentina lxxxvi. 301 (1918).—The type of this species came from 2350 m. altitude in the valley of the Rio Tupungal near the confluence of the latter with the Rio Mendoza in northwestern Mendoza, Argentina. I have seen no material of the species. Its nutlets, described as "lisses, brillants, ovoides, à extrémité supérieure assez pointue," are apparently quite different from those of any other South American species of the genus. The species is said to be a slender herbaceous annual, though perhaps it may be perennial as are the other South American species, and has like some of them been described from year-old material. This latter seems improbable, however, since Hauman mentions collections made on widely different dates.

4. C. DARWINI (Hook. f.) Gray, Proc. Am. Acad. v. 341 (1862). *Galapagoa Darwini* Hook. f. Trans. Linn. Soc. xx. 196 (1847); Anderss. Stockholm Acad. Handl. 1853, 86, t. 16, fig. 1 (1854). *G. fusca* Hook. f. l. c. 197; Anderss. l. c. 87, t. 16, fig. 2. *C. fusca* Gray, l. c.—Endemic to the Galapagos Archipelago. I have studied a series of twenty-nine different collections from the Galapagos Islands and am forced to the conclusion that the archipelago has but one variable species of

Coldenia. The island plants vary considerably in compactness, size, and pubescence of leaves, but these differences seem clearly responses to different habitats. *Galapagoa Darwini* and *G. fusca* appear to be merely trivial inconstant pubescence-forms which are not restricted to separate islands, but occur together on most of the latter. I find not the slightest tendency for the reoccurrence of the particular combination of characters present in Hooker's original specimens.

5. C. PARONYCHIOIDES Phil. Cat. Itin. Tarapaca 55 (1891); Reiche, Fl. Chile v. 190 (1910). *Lithospermum aggregatum* R. & P. Fl. Peruv. ii. 4 (1799). *C. aggregata* Rusby, Descr. New Sp. So. Amer. 106 (1920); not based upon *L. aggregatum* R. & P. (?) *C. tenuis* Phil. l. c.; Reiche, l. c.—PERU: Payta, *Safford 9* (US), *Ball* (NY, G), *Williams 2913* (NY, type of *C. aggregata* Rusby); Yonga, *Wilkes Exped.* (US, NY, G). BOLIVIA: La Paz, *Rusby 1430* (NY).—The species appears to range from northern Peru to northern Chile. *Lithospermum aggregatum* R. & P. is the oldest name applied to the species, but it is not taken up since the combination under *Coldenia* would have an homonym in *Coldenia aggregata* Rusby. *Coldenia aggregata* Rusby was based upon material from Payta in northwestern Peru and was named without any reference to the species, founded upon material from near Tarma and Huanuco in west central Peru, which was much earlier described as *Lithospermum aggregatum* by Ruiz & Pavon. *Coldenia aggregata* Rusby, being a synonym, *L. aggregatum* R. & P. might according to the International Rules of Nomenclature be combined under *Coldenia* and the resulting combination be taken as the proper name for the species; however, since this procedure would give the same species synonymous homonyms it is thought that the possibilities of confusion arising from this awkward situation justifies the acceptance of Philippi's specific name. The original Philippian collection came from Pampa del Tamarugal, province of Tarapacá, Chile.

6. C. LITORALIS Phil. Fl. Atacamensis 37 (1860); Reiche, Fl. Chile v. 189 (1910). *C. mitis* Phil. Anal. Univ. Chile xc. 229 (1895). *C. virens* Phil. l. c.—CHILE: deserts of Atacama, *Morong 1257* (US, NY, G); Caldera, *Ball* (NY, G).—Apparently endemic to the province of Atacama, Chile. The type of *C. litoralis* came from the coastal sands at Caldera, Chile. I am following Reiche, l. c., in reducing Philippi's later species.

7. C. ATACAMENSIS Phil. Fl. Atacamensis 37 (1860); Reiche, Fl. Chile v. 189 (1910).—Known to me only from description. Ac-

cording to Reiche, l. c., it occurs in the interior of the province of Antofagasta, Chile.

8. C. PARVIFLORA Phil. Cat. Pl. Itin. Tarapaca 55 (1891); Reiche, Fl. Chile v. 190 (1910). *C. elongata* Rusby, Descr. New Sp. So. Amer. 106 (1920).—Yura, "Peru," *Williams 2562* (NY, type of *C. elongata*). Arequipa, "Bolivia," *Williams 2521* (NY). Southern slopes of Chachani Mountain near Arequipa, *Hinkley 11* (G).—Apparently ranging from southern Peru and adjacent Bolivia, southward to the province of Tarapacá, Chile. The species seems to differ from *C. atacamensis* in its small corollas and more northern range.

EXCLUDED SPECIES.

Coldenia glabra Phil. Anal. Univ. Chile xc. 230 (1895). According to Reiche, Fl. Chile v. 191 (1910), this is a synonym of FRANKINIA GLABRATA Phil.

Coldenia phaenocarpa Phil., Cat. Pl. Itin. Tarapaca 55 (1891). Reiche, l. c., has shown this to be a Heliotropium, H. PHAENOCARPA (Phil.) Reiche.

II. TAXONOMIC RECORDS CONCERNING AMERICAN SPERMATOPHYTES.

1. PARKINSONIA AND CERCIDIUM.

Both *Cercidium* and *Parkinsonia* appear to be valid genera, but their acceptance can be justified only after a slight change in their traditional limits and the stressing of characters not heretofore emphasized by those who have maintained the genera. All authors have sanctioned the recognition of *Parkinsonia*, and most recent students have insisted on the validity of *Cercidium*. The writers on the flora of Argentina, disregarding the obviously albuminous seeds produced by their "Brea," have persisted in treating their species of *Cercidium* as a *Caesalpinia*, but there are good morphological characters and overwhelming usage arguing against this treatment. Karsten, Fl. Colomb. ii. 25, t. 113 (1862), proposed a segregate genus *Rhetinophloem*, but later, Engler's Jahrb. viii. 346 (1887), reduced it to a subgenus of *Cercidium*. In 1876, Watson, Proc. Am. Acad. xi. 135 (1876), concluded that the characters used to separate *Cercidium* and *Parkinsonia* failed when applied to the North American species and proceeded to merge the two genera. Watson's opinion prevailed until 1889 when Sargent, Gard. & Forest ii. 388 (1889), reopened the

matter and reestablished *Cercidium*. This decision was based on his finding that "the valvate imbrication of the calyx-lobes is constant in *Cercidium* and that the thickened glandular claw of its petals does not appear in our species of *Parkinsonia*," and further and more important that "the fruit which in *Parkinsonia* is linear, rounded and torose," is in *Cercidium* "linear-oblong compressed, and in one of our species slightly contracted between the seeds." Since 1889 the acceptance of *Cercidium* has been almost universal.

A study of the material in the Gray Herb. (G), and some very interesting collections from the United States National Herbarium (US) which were loaned me through the interest of Dr. J. N. Rose, has shown that the sepals are not always simply valvate in *Cercidium*, but rather that there seems to be intraspecific variation between valvate and induplicate-valvate conditions. In fact these variations were used by Karsten as characters of his subgenera, *Eucercidium* and *Rhetinophloem*. I am unable to see even specific differences in this character since both conditions frequently occur on the same specimen. In *Parkinsonia*, as currently taken, the calyx-lobes are not always imbricate, since *P. microphylla* has valvate calyx-lobes quite indistinguishable from those in indubitable Cercidiums. It is only in *Parkinsonia aculeata* (the type species of *Parkinsonia*) and *P. africana* that very definitely imbricate aestivation occurs, and then in such an extreme form as not to be even approached by the conditions in the species of *Cercidium* or the other species of *Parkinsonia*. A study of the claw of the petal has revealed no difference between the two genera.

The characters of generic import currently ascribed to the fruit of *Cercidium* and *Parkinsonia* fail miserably when they are applied to all the known species of the genera. *Parkinsonia aculeata* and *P. africana* are very closely related and are obviously congeneric, but the latter has the legumes somewhat compressed with thickened almost straight margins, so that they appear quite different from the terete torose pods of *P. aculeata*. The fruits of *P. africana* and *C. texanum* are very similar as to margin, width, and thickness, in fact the only conspicuous difference is in the length. Practically every species of *Cercidium* frequently has the margin of its legumes more or less sinuate or even contracted between the seeds.

Sargent, Man. Trees N. Am. 585 (1922), finds generic difference in the relations of the spine to the leaves, giving the leaf-rachis as spinescent in *Parkinsonia* and not so in *Cercidium*. In fact the leaf-rachis is spinescent only in *P. aculeata* and *P. africana*. In the plant called

P. microphylla there are no spines, whereas in its near relative, *Cercidium sonorae*, the spines are clearly below the leaf-rachises and exactly as in other indubitable Cercidiums.

Past authors have accepted *Parkinsonia microphylla* Torr., as a member of *Parkinsonia*, being largely influenced in so doing, no doubt, by the extreme similarity in its fruit with that of *P. aculeata*. However, *P. microphylla* differs from *P. aculeata* and *P. africana* in having short corymbose rather than very elongate racemes, short filiform terete rather than extremely long phyllodial leaf-rachises, and calyx-lobes that are valvate or a trifle induplicate-valvate rather than extremely imbricate in the bud. It is significant that these characters are possessed by all the species of *Cercidium*, and that *P. microphylla* in habit resembles the species of *Cercidium* much more than it does the two species of genuine *Parkinsonia*. In brief, *Parkinsonia microphylla* is clearly a species of *Cercidium* and is consequently transferred to that genus. *Parkinsonia* thereby reduced to homogeneity consists only of *P. aculeata* and *P. africana*. *Parkinsonia* and *Cercidium*, then, become two well marked and very natural genera eminently worthy of recognition, as may be appreciated by a study of the following key:—

Inflorescence an elongate raceme, 8–18 cm. long; rachis of pinnae phyllodial, 1–6 dm. long, apparently borne on the spines; calyx-lobes very strongly imbricate in the bud ..... *Parkinsonia.*

Inflorescence a short corymb, 1–3 cm. long; rachis of pinnae 1–4 cm. long, terete, never phyllodial, clearly borne below the spines; calyx-lobes valvate or induplicate-valvate in bud ..... *Cercidium.*

Parkinsonia [Plum.] L. Sp. Pl. 375 (1753); Gen. Pl. 177 (1754).

Key to Species.

Rachis of pinnae winged, 1.5–3 mm. wide, 15–60 cm. long; pinnae ca. 25-jugate; legumes torose, terete, margin very strongly undulate but scarcely thickened ..... 1. *P. aculeata.*

Rachis of pinnae not winged, 1 mm. wide, 5–15 cm. long; pinnae 15-jugate or less so; legumes somewhat compressed, scarcely torose, margins slightly undulate and evidently thickened. 2. *P. africana.*

1. Parkinsonia aculeata L. Sp. Pl. 375 (1753). *P. spinosa* HBK. Nov. Gen. et Sp. vi. 335 (1823). *P. Thornberi* Jones, Contr. W. Bot. xii. 12 (1908).—Native of America, but widely cultivated over the warmer parts of the world. For notes regarding its distribution see the account by Sargent, Silva N. Am. iii. 87, t. 81 (1892). The name "*Parkinsonia spinosa* HBK" is evidently a *lapsus* meant for *P. aculeata* L. The specimen cited by Kunth is apparently not

P. aculeata, however, but is the collection which finally became the type of *Cercidium spinosum* Tul.

2. P. AFRICANA Sond. Linnaea xxiii. 38 (1850); Engler, Veg. der Erde ix. Band 3, Heft 1, 501, fig. 267 (1915).—Known only from South Africa.—AFRICA: on a stony plain, Damaraland, *Marloth 1216;* without locality, *Zeyher 557*.

CERCIDIUM Tul. Arch. Mus. Paris iv. 133 (1844). *Rhetinophlocum* Karsten, Fl. Colomb. ii. 25, t. 113 (1862)

KEY TO SPECIES.

Pinnae 1–3-jugate.
  Ovary densely sericeous-strigose; pinnae 1- or occasionally 2-jugate.....1. *C. texanum.*
  Ovary glabrate; pinnae commonly 3-jugate.
    Pod very flat, 2–3 mm. thick, 8–11 mm. wide; leaves green; branches dull green.....2. *C. macrum.*
    Pod thickened, 5 mm. thick, 10–15 mm. wide; leaves pale; branches pallid.
      Twigs glabrate, very pale.....3. *C. floridum.*
      Twigs densely short-pubescent, cinerascent.....4. *C. peninsulare.*
Pinnae 4–15-jugate.
  Leaves appearing simply pinnate, primary rachises undeveloped; pinnules minute, ca. 1–1.5 mm. broad, 1–2.5 mm. long.
    Plant unarmed; leaflets orbicular or ovate; fruit torose, terete; North American.....5. *C. microphyllum.*
    Plant with long spines; leaflets narrowly oblong; fruit very flat, margin straight; South American.....7. *C. andicola.*
  Leaves or most of them evidently bipinnate, primary rachises developed; pinnules larger, 1–2.5 mm. broad, 2–7 mm. long.
    Leaves conspicuously pubescent, cinereous.....8. *C. praecox.*
    Leaves glabrate or glabrous, glaucous or yellow-green.
      Legumes 4–7 cm. long, 4 mm. thick, margin strongly undulate; Sonora.....6. *C. sonorae.*
      Legumes 3–5 cm. long, 1–2 mm. thick, margin not at all undulate; Argentina.....9. C. *australe.*

1. CERCIDIUM TEXANUM Gray, Pl. Wright. i. 58 (1852). *Parkinsonia texana* Wats. Proc. Am. Acad. xi. 136 (1876).—Southwestern Texas. TEXAS: Uralde, 90 mi. northwest of San Antonio, 1879, *Palmer 270;* Eagle Pass, 1879, *Palmer 271;* Rio Grande, 1848, *Wright;* without locality, *Pope;* western Texas, 1849, *Wright 149;* without locality, 1852 [*Wright*]; "New Mexico," 1851, *Wright 115*.

2. **C. macrum**, sp. nov., arboreum; ramulis glabratis opacis viridibus; spinis 0.7 mm. longis; foliis opacis sparse inconspicueque strigosis unijugis, rachibus primariis 4–8 mm. longis; pinnis trijugis, rachillis 7–15 mm. longis; pinnulis oblongis vel oblongo-obovatis emarginatis vel rotundatis sessilibus 4–6 mm. longis 2–3.5 mm. latis, basi acutis

saepe paullo obliquis, costis conspicuis; floribus in racemas pauciflores axillares subcorymbosas congestis; ovario glabro; leguminibus valde compressis 2–3 mm. crassis 8–11 mm. latis 3–6 cm. longis, margine rectis vel paullo undulatis; seminibus brunneis oblongis ca. 7 mm. longis 4 mm. latis.—*C. floridum* of authors. *C. floridum* of Sargent, Silva N. Am. iii. 83–4, t. 129 (1892), as to plant described and pictured. *Hoopesia arborea* Buckley, Proc. Acad. Philad. 1861, 453 (1861), in part; 1870, 137 (1870); Gray, Proc. Acad. Philad. 1862, 163 (1862).—TEXAS: Rio Hondo, Cameron Co., *Chandler 7034;* Fordyce, 1905, *Tracy 9065;* hills, La Salle Co., 1881, *Buckley*. TAMAULIPAS: San Fernando to Jimeney, 1902, *Nelson 6608;* vicinity of Victoria, 1907, *Palmer 125*. NUEVO LEON: mesas near Monterey, 1889, *Pringle 2537* (TYPE, Gray Herb.); near Pesquerea Grande, northwest of Monterey, 1847, *Gregg;* without locality, *Gregg;* Nuevo Leon, *Berlandier 3142* (707).—This species is the well known one of Texas and northeastern Mexico current as *Cercidium floridum* Benth. That species, however, is based upon a flowering specimen made by Coulter who did not collect within the range of *C. macrum*. Coulter did, on the other hand, collect within the range of the common "Palo Verde" of Arizona. It therefore seems evident that Bentham's name cannot properly be applied to the plant here called *C. macrum*, since it was impossible for Coulter to have collected it, and since it seems more than probable that Bentham's name should be applied to the closely related species of Arizona which Coulter could scarcely have missed collecting. The Gregg and Wislizenus collections cited under Gray's original description of "*Cercidium floridum* Benth." represent *C. macrum*, those of Emory and Fremont are true *C. floridum*. From their source, Corpus Christi, it seems probable that the fragments of *Cercidium* in the complex type of *Hoopesia arborea* belong to *C. macrum* rather than to *C. texanum*. *Hoopesia arborea* was based, according to Gray, Proc. Philad. 1862, 163 (1862), upon material representing three distinct leguminous genera (*Cercidium*, *Acacia*, and *Pithecollobium*). No particular one of the three elements predominates in Buckley's description nor in his material. I am not definitely associating *Hoopesia arborea* with any species, but am dropping it from consideration as a *nomen confusum*.

3. C. FLORIDUM Benth. in Gray, Pl. Wright. i. 58 (1852). *Parkinsonia florida* Wats. Proc. Am. Acad. xi. 135 (1876). *P. Torreyana* Wats. l. c. *C. Torreyanum* Sarg. Gard. & Forest ii. 388 (1889); Silva N. Am. iii. 85, t. 80 (1892).—Southern Arizona to the Colorado Desert of California, southward into adjacent Sonora and Lower

California.—Arizona: near Fort Yuma, 1880, *Lemmon 39, 40;* rocky hills at Camp Grant, 1867, *Palmer 62;* Gila [River], *Sutton Hayes 209;* valley of the Gila, *Emory;* Gila [River], 1852, *Thurber;* near the Colorado [River], *Bigelow;* without locality, 1867, *Palmer.* California: Palm Springs, alt. 150–200 m., *Parish 4115;* in desert sand, Palm Spring, alt. 120 m., *Spencer 755;* Palm Springs, *Eastwood 3004.* —For the present use of the name "*Cercidium floridum* Benth." see discussion under *C. macrum.*

4. C. peninsulare Rose, Contr. U. S. Nat. Herb. viii. 301 (1905); Goldman, Contr. U. S. Nat. Herb. xvi. 336, t. 114 (1916).—Southern Lower California.—Lower California: La Paz, 1890, *Palmer 112;* San José del Cabo, 1897, *Anthony 363.*—This differs from *C. floridum* in scarcely more than pubescence. In range, however, it is widely separated from that latter species.

5. **C. microphyllum** (Torr.) Rose & Johnston, comb. nov. *Parkinsonia microphylla* Torr. Bot. Mex. Bound. 59 (1859); Pacif. R. R. Rep. iv. 82 (1857); Sargent, Silva iii. 91, t. 132 (1892).—Southern Arizona, Sonora, and middle and northern Lower California.—Arizona: poor rocky hills, Camp Grant, 1867, *Palmer 63;* Gila [River], *Sutton Hayes 217;* Williams River, *Bigelow;* desert near Fort Yuma, 1880, *Lemmon 41;* Maricopa, 1881, *Parry;* Lowell, 1884, *W. F. Parish 49;* without locality, 1871, *Lieut. Wheeler.*

6. **C. sonorae** Rose & Johnston, sp. nov., arboreum; ramulis breviter strigosis canescentibus; spinis 0–9 mm. longis; foliis sparse pubescentibus 1–2-jugis, rachibus primariis 0–5 mm. longis apice subulato caduco 1–2 mm. longo; pinnis 2–4-jugis 12–32 mm. longis; pinnulis subsessilibus 1.5–2 mm. latis 2–3 mm. longis oblongis basi oblique rotundatis, apice obtusis mucronatis costa conspicua; inflorescentiis axillaribus corymboso-racemosis paucifloris; dense breviterque pubescentibus; leguminibus 4–7 cm. longis 4 mm. crassis 7–8 mm. latis margine valde undulatis; seminibus oblongis 1 cm. longis 4 mm. latis. —Sonora: Guadeloupe, Feb., *Parry 321a* (G); Torres, 1903, *Coville 1664* (US); Guaymas, 1922, *Orcutt 1196* (US); dry hills in the vicinity of Guaymas, 1910, *Rose, Standley & Russell 12586* (type, U. S. Nat. Herb.).—A very well marked species apparently nearest to *C. microphyllum*, but differing in its thorny stems, larger, petioled and frequently several-jugate leaves, more compressed less torose legumes, and much smaller seeds. The species is known only from Sonora.

7. C. andicola Griseb. Abh. Ges. Wiss. Goett. xxiv. 114 (1879). *Caesalpinia praecox*, var. *andicola* Hoss. Bol. Acad. Córdoba xxvi.

145 (1921).—Northern Argentina and southern Bolivia.—BOLIVIA: Toldos near Bermejo, 1800 m. alt., 1903, *Fiebrig 2193* (G).

8. C. PRAECOX (R. & P.) Harms in Engler Jahrb. xlii. 91 (1908). *Sappania praecox* R. & P. Fl. Peruv. t. 376, ined. *Caesalpinia praecox* H. & A. Bot. Misc. iii. 208 (1833), as to description and accepted name. *Cercidium spinosum* Tul. Arch. Mus. Hist. Nat. Paris iv. 134 (1845). *Rhetinophloem viride* Karsten, Fl. Colomb. ii. 25, t. 113 (1862). *Cercidium viride* Karsten in Engler, Jahrb. viii. 346 (1887). *Cercidium plurifoliolatum* Micheli, Mém. Soc. Phys. et Hist. Nat. Genève xxxiv. 269, t. 18 (1903). *Cercidium Goldmani* Rose, Contr. U. S. Nat. Herb. viii. 301 (1905). *Cercidium unijugum* Rose, l. c.—Extreme middle-western Peru to northern Venezuela, the Leeward Islands (Curaçao *fide* Urban, Margarita), Santo Domingo (*fide* Urban), and southern and western Mexico.—ECUADOR: between Loja and Portovelo, *Rose, Pachano & Rose 23330* (US). VENEZUELA: El Valle, Margarita Island, alt. 200 m., 1903, *J. R. Johnston 31* (G). La Vela de Coro, 1917, *Curran & Haman 423, 468, 499* (G); Cumana, 1917, *Curran & Haman 1251* (G). MEXICO: Santa Lucia, Oaxaca, 1908, *Purpus 3187* (G); hills, Dominguillo, Oaxaca, alt. 900 m., 1895, *L. C. Smith 437* (G); between Teotitlan and San Antonio, Oaxaca, alt. 900 m., 1907, *Conzatti 2119* (G); San Luis, Guerrero, alt. 100 m., 1899, *Langlassé 933* (G); Orizaba, Vera Cruz, *Botteri 994* (G); Maria Madre Island, Tepic, 1897, *Maltby 62* (US); vicinity of Fuerte, Sinaloa, 1910, *Rose, Standley & Russell 13516* (US); San José del Cabo, Lower Calif., 1911, *Rose 14466* (US); Guaymas, Sonora, 1897, *Maltby 186* (US); dry cactus plain near Navojoa, Sonora, 1910, *Rose, Standley & Russell 13176* (US); La Tinajo, Sonora, 1890, *Hartman 241* (G).—I have searched in vain for characters of sufficient constancy to justify the treating of the Mexican material as representing a valid species. It can be generally said that the South American material has smaller flowers and darker branches than the Mexican, but these characters are erratic and can scarcely be used for specific distinction. The type of Ruiz & Pavon's species came from middle western Peru and is distinct from the plant of the Argentine which authors, following Hooker & Arnott, have confused with it. A discussion of this subject will be found under the next species.

9. **C. australe**, sp. nov., arboreum vel arbusculum 1–8 m. altum spinosum; ramulis glabratis vel sparsissime strigoso-pilosis striatis pallide viridibus; spinis 8–15 mm. longis rectis; foliis bipinnatis 1–2-jugis glabratis vel sparsissime adpresseque pilosis flavo-viridibus, rachibus primariis 5–10 mm. longis; pinnis 5–7-jugis rachibus 1–2

cm. longis; pinnulis oblongis 1–2 mm. latis 2–5 mm. longis obtusis basi subobliquis; petiolulis ca. 0.2 mm. longis; floribus breviter corymboso-racemosis; petalis luteis immaculatis maxime ca. 1 cm. longis; leguminibus membranaceis valde compressis acutis reticulatim venosis glabratis 3–5 cm. longis 8–10 mm. latis 1–1.5 mm. crassis margine rectis.—*Caesalpinia praecox* of H. & A., Bot. Miscl. iii. 208 (1833); as to plant of Gillies, not as to R. & P. name or plate. *Cercidium praecox* of Manganara, Anal. Soc. Cient. Argent. lxxxvii. 163 (1919), and other recent authors. *Cercidium andicola*, var. *petiolata* Chod. & Hass. Bull. Herb. Boiss. n. s. iv. 828 (1904).—Central Argentina and adjacent Paraguay.—ARGENTINA: Andalgalá, Prov. Catamarca, *Jörgensen 1119* (G); vicinity of General Roca, Rio Negro, alt. 250–360 m., 1915, *W. Fischer 20* (TYPE, Gray Herb.); San Juan, Mendoza, *Jameson* (G).—Although this tree of the Argentine has long borne the name *Caesalpinia praecox* or *Cercidium praecox*, it seems clear that it has been improperly so called. *Caesalpinia praecox* was published by Hooker & Arnott in 1833 after they had concluded that a plant collected by Gillies in Mendoza was specifically identical with Ruiz & Pavon's manuscript species, *Sappania praecox*, and its unpublished plate. Gillies's specimen represents the Argentine plant that has passed as *C. praecox* and which is here named, *C. australe*. Since Ruiz & Pavon did not collect in Argentina or at all close to the range of *C. australe*, and described in their flora only material collected by themselves or Dombey in either Chile or Peru, it must be clear that *Sappania praecox* R. & P. cannot be the plant that Hooker & Arnott thought it to be. Since there is a *Cercidium* which occurs in middle-western Peru where Ruiz & Pavon did much collecting, it certainly seems much more natural to assume this to be the *Cercidium* collected and illustrated by them. This plant I doubtfully associate with the Venezuelan species, current as *Cercidium spinosum* Tul. Hooker & Arnott's description of "Caesalpinia (Sappania) *praecox* (R. et Pav. *Fl. Perur. t. 376. ined.*)" is perfectly ambiguous, applying equally well to the Argentinian and to the more northern plant. Since Ruiz & Pavon's name was taken up and their plate cited, and since their plant is not at all excluded by the original description but agrees with the diagnosis as well as does the Argentinian plant, I am confining their name to the plant for which it was originally intended, and am consequently giving a new name to the "Brea" of the Argentine. The plant from Mendoza differs from the common form of *C. australe* in having its ovary velvety-pubescent. It may be worthy of nomenclatorial recognition.

2. New or otherwise noteworthy Plants.

Persea Hartmanii, sp. nov., glabrata arborea 6–9 m. alta; ramis juventate fulvo-tomentosis; foliis anguste ellipticis vel lanceolatis glabratis 6–11 cm. longis 15–36 mm. latis basi cuneatis apice saepe acutis subtus pallidioribus; petiolis 1–2 cm. longis vetustis glabratis canaliculatis; inflorescentiis paucifloris laxe paniculatis 7–10 cm. longis glaberrimis folia paullo superantibus; pedunculis gracilibus 4–7 cm. longis; pedicellis 4–6 mm. longis; floribus ca. 4 mm. longis; calycis lobis ovatis acutis ca. 2.5 mm. longis subaequalibus extus glaberrimis intus paullo strigosis medium versus articulatis superiori parte decidua; staminibus exterioribus introrsis 2 mm. longis, antheris oblongo-linearibus ca. 0.9 mm. longis 4-locularibus, loculis inferioribus latis longioribus superiores lateraliter oblique tangentibus, filamentis sparse villosis angustis; staminibus introrsis exteriores simulantibus sed basem versus biglanduliferis, glandulis ovatis sessilibus; staminodiis ca. 9 mm. longis, capitulis acute sagittatis quam stipes duplo longioribus, stipitibus villosis crassis capitula latitudine aequantibus; ovariis glabris globosis.—Mexico: Batopilas, Chihuahua, April 1892, *C. V. Hartman 1029* (type, Gray Herb.).—Although in gross habit suggesting a species of *Phoebe*, in technical characters this seems clearly a *Persea*. It is well marked in the latter genus appearing to be without immediate relatives. The outstanding features of the plant are its glabrous ovary and flowers, and peculiar calyx-lobes. These latter have a transverse medial line of abscission.

Persea podadenia Blake, var. **glabriramea**, var. nov.; caulibus et pedunculis glaberrimis castaneis.—Mexico: Orizaba, *Botteri 81* (type, Gray Herb.), *1166*.—The type of *P. podadenia* comes from Durango and is very densely strigose.

Phoebe longipes, sp. nov., glaberrima; foliis lanceolatis 12–22 cm. longis 4–5.5 cm. latis longe falcato-acuminatis subtriplinerviis supra laevibus subtus paullo pallidioribus delicate reticulatis basi rotundatis vel rare cuneatis; petiolis 25 mm. longis; ramulis laevibus glaucescentibus fuscis; inflorescentiis laxissime paniculatis ca. 1 dm. longis quam foliae valde brevioribus paucifloris; pedunculis gracilibus ca. 6.5 cm. longis ascendentibus; pedicellis gracilibus 15–25 mm. longis; bracteolis deciduis; floribus ca. 4 mm. longis; calycis segmentis ovatis acutis 2.5 mm. longis subaequalibus extus glaberrimis intus paullo strigosis; staminibus exterioribus 1.8–2 mm. longis introrsis, antheris oblongis ca. 1 mm. longis, loculis 4 valde 2-seriatis; staminibus interioribus exterioribus similibus sed extrorsis et cum filamentis saepe villosis basin versus abrupte dilatatis et cum glandulis disciformibus

munitis; staminodiis ca. 1.6 mm. longis, capitulis ca. 4 mm. longis deltoideo-ovatis stipite compresso strigoso duplo longioribus; ovariis glabratis globoso-ovoideis; stylo glabro quam ovarium ½ longiori.—MEXICO: without precise locality, *Pringle 8829* (TYPE, Gray Herb.).—Apparently most closely allied to *P. salicifolia* Nees, but differing in having longer petioles and pedicels, as well as larger leaves and flowers. The type was probably collected in south-central Mexico.

Misanteca costaricensis, sp. nov., paniculata arborea 7–10 m. alta; ramis glabris; foliis elliptico- vel obovato-oblongis glabris concoloribus 10-14 cm. longis 3–5 cm. latis, subtus sparse delicateque reticulatis; supra inconspicue reticulatis, basi cuneatis, apice breviter acuminatis, petiolis ca. 15 mm. longis quadrangularibus; inflorescentiis paniculatis 5–10 cm. longis dense brunnescenterque villoso-velutinis; floribus ad apices pedunculorum laxe pyramidaliterque congestis; pedicellis 1–2 mm. longis sparse villosis; calyce ca. 1.5 mm. longo infundibuliformi vel subobconico brunneo extus glabrato, lobis 6 late ovatis obtusis intus sparse pubescentibus, exterioribus ca. 0.8 mm. longis, interioribus ca. 0.6 mm. longis; staminibus 3 connatis ca. 1 mm. longis conspicuis; antheris glabratis crasse bilocularibus; filamentis latis dense villosis; glandulis 3 distinctis semiorbicularibus vel ellipticis basi ad androphorum adfixis; staminodiis absentibus; ovario glabro ovato quam stylus ½ breviori.—COSTA RICA: Santiago Hills near San Ramon, 1100 m. alt., June 1, 1901, *A. M. Brenes 14403* (TYPE, Gray Herb.).—Related to the West Indian *M. triandra* (Sw.) Mez, but differing in its villose-velutinous inflorescence, distinct entire glands on the androphore, and larger more elongate less gradually acuminate leaves. It is readily separated from the remaining species of the genus, all close allies of *M. capitata* C. & S., by its velutinous loose paniculate inflorescence and smaller less prominently reticulate leaves.

Misanteca Peckii, sp. nov., arbor parva cum floribus racemosis; ramis brunnescenter et dense hirsuto-villosis; foliis oblanceolatis vel obovato-oblongis basi cuneatis apice abrupte longeque acuminatis margine paullo revolutis supra nitidis glabris conspicue impresseque nervatis subtus setosis opacis pallidis valde conspicueque nervatis petiolis 9–12 mm. longis, inflorescentiis racemosis 2–3 cm. longis; paucifloris brunnescenti-velutinis; floribus atro-coeruleis valde depressis 1.8–2.2 mm. diametro 1.5 mm. altis subcarnosis; pedicellis 0.2–1 mm. longis lobis 6 valde 2-seriatis, exterioribus latissime triangularibus ca. 1.5 mm. latis 0.6 mm. altis, interioribus deltoideis obscuris ca. 0.3 mm. altis; staminibus 3 in androphorum latum pyra-

midale connatis; antheris 2-locellatis late obovatis glabratis, locellis supra medium impositis; filamentis nullis (?); staminoidiis nullis; glandulis confluentibus ad basem androphori in annulum undulatum confluentibus; ovario globoso glabrato; bacca ellipsoidea ca. 2.2 cm. longa 11 mm. diametro coccinea; cupulo cyathiformi conspicue duplomarginato, basi incrassato.—British Honduras: locality not given, 1905–7, *M. E. Peck 826* (type, Gray Herb.).—A very distinct species and perhaps representing an undescribed genus since it differs from the other members of *Misantea* in its few-flowered racemose inflorescence, depressed broad rather pulpy flowers, strongly bicolored leaves, and stamens which appear to lack filaments and are connate to form a very broad pyramidal rather than columnar androphore. The type was probably collected in middle eastern British Honduras.

Calliandra socorrensis, sp. nov., fruticosa glabra; caulibus rigidis laxe multiramosis; foliis glaberrimis numerosis; pinnis bijugis 15–30 mm. longis; foliolis 5–7-jugis congestis 4–12 mm. longis 2–4.5 mm. latis firmis oblongis apice obtusis basi valde obliquis; stipulis persistentibus oblongo-lanceolatis ca. 2–3 mm. longis acutis; pedicellis 1–2 mm. longis; pedunculis axillaribus 2–3 cm. longis ascendentibus; floribus ignotis; leguminibus glabris ca. 5-spermis, valvis membranaceo-coriaceis reticulatis incrassato-marginatis 5–6 cm. longis 8–9 mm. latis.—Mexico: Socorro Island, 1897, *A. W. Anthony* (type, Univ. Calif. Herb. no. 83534).—Most nearly allied to *C. formosa* (Kunth) Benth., a species ranging widely over northern and western Mexico, from which it differs in its much branched compact wood habit, and much smaller crowded leaflets.

Piscidia acuminata (Blake), comb. nov. *Ichthyomethia acuminata* Blake, Jour. Wash. Acad. ix. 249 (1919).

Piscidia communis (Blake), comb. nov. *Ichthyomethia communis* Blake, Jour. Wash. Acad. ix. 247 (1919).

Piscidia grandifolia (Donn. Sm.), comb. nov. *Derris grandifolia* Donn. Sm. Bot. Gaz. lvi. 55 (1913).

Fagonia cretica, var. **canariensis**, var. nov., prostrata ramosa *F. creticae*, var. *typicam* simulans sed differt floribus et fructibus perspicue minoribus; fructibus 5–6 mm. crassis; petalis 6–7 mm. longis.—Canary Islands: roadside near Guia, Gran Canaria, Dec. 1893, *Cook 77;* arid open lower parts of Teneriffe, Jan. 1845, *Bourgeau 46;* littoral belt near Santa Cruz, Teneriffe, April 1888, *J. Ball* (type, Gray Herb.).—This plant of the Canary Islands has passed as *F. cretica* L., but that is a plant of the Mediterranean basin which has fruit 6–7.5 mm. thick and petals 7–10 mm. long. The variety

canariensis, because of its smaller fruit and flowers, is very suggestive of the common American forms of the genus, and it was perhaps this fact that gave Engler, Veg. der Erde ix. Band 3, Heft 1, 731 (1915), his reasons for treating the plants of America as *F. cretica* var. *chilensis* (H. & A.) Engler, var. *californica* (Benth.) Engler, and var. *asper* (Gay) Engler. However, Standley, Proc. Biol. Soc. Wash. xxiv. 244 (1911), has pointed out that the American plants are distinguishable from true *F. cretica* by the possession of a fruit which is noticeably smaller in size, and which has a shorter, scarcely thickened beak. As the American plants are widely separated geographically from their closest ally, *F. cretica*, of the Old World, and since the collections from the two regions are distinguishable by their fruit, it seems best to consider them specifically distinct, and to take up *F. chilensis* H. & A. as the comprehensive name for the American relatives of *F. cretica*.

Some writers, such as Anderson, Jour. Linn. Soc. v. suppl. 11 (1860), and the editors of the Index Kewensis, have referred practically all the described forms of *Fagonia* to *F. cretica*. This treatment, however, is extreme, for there appears to be a goodly number of species in northern Africa and southwestern Asia which are well defined entities with characteristic habit and natural ranges. Most of the species have several synonyms, and in a number of cases the current name is not always the oldest. For example, *F. indica* Burm. f., founded on a good description and plate, has been disregarded for such comparatively recent synonyms as *F. persica* DC., *F. mysorensis* Roth, *F. microphylla* Boiss., *F. myriacantha* Boiss., and *F. parviflora* Boiss.

Protium panamense (Rose), comb. nov *Icica panamensis* Rose, N. Am. Fl. xxv. 260 (1911).

Euphorbia (§**Tithymalus**) **Hinkleyorum**, sp. nov., perennis e radice erecta crassa oriens 1–2 dm. alta glaberrima; caulibus compluribus erectis herbaceis medium versus laxe dichotomeque ramosis; foliis caulinis inferioribus alternatis sparsis, caulinis superioribus et rameis oppositis valde conspicuis, omnibus glabris concoloribus late adfixis 8–24 mm. longis et latis palminerviis distinctis lacerato-dentatis orbicularibus vel obovatis vel subflabelliformibus basi truncatis vel cuneatis edentatis symmetricis; stipulis nullis; involucris solitariis axillaribus glabris cyathiformibus ca. 2 mm. longis ca. 1 mm. longe pedunculatis, fauce cum lobis subulatis vel anguste deltoideis hirsutis ca. 0.5 mm. longis munita; glandulis 5 ca. 1.3 mm. longis et latis, subtus pallidis rariter hirsutis, supra laminato-rugosis brunneis,

margine retusis vel truncatis undulatis; stylis ca. 1.5 mm. longis, lobis bipartitis glabris; stigmatibus paullo incrassatis; capsula glabra ca. 2 mm. longa ca. 4 mm. pedunculata; seminibus oblongis obscure quadrangularibus ca. 2 mm. longis ca. 1.3 mm. crassis ecarunculatis griseis delicate impresse atromaculatis.—PERU: sandy pampa on the southern slopes of Chachani Mountain near Arequipa, alt. 3300 m., March 1920, *Mr. & Mrs. F. E. Hinkley 7* (TYPE, Gray Herb.).—This species evidently belongs to Boissier's subsection *Ipecacuanhae*, and probably has its nearest relative in the variable but very different *E. portulacoides* Spreng., from which it differs in its larger dark-colored coarsely toothed apparently connate (though really distinct) broader leaves, and much more loosely branched habit. In foliage *E. Hinkleyorum* suggests the Galapagean, *E. amplexicaulis* Hook. f., in the shape and attachment of its upper leaves. It is, however, not at all closely related to that species. According to its discoverers the plant is known as "esquera" and is used in the treatment of fevers.

Malvastrum Hinkleyorum, sp. nov., annuum simplex erectum 1.5–4.5 dm. altum glabratum vel apicem versus sparse villosum et setosum; caulibus stramineis gracilibus; foliis palmate 3-foliolatis 3–4.5 cm. longis; foliolis acutis oblanceolatis lacerato-dentatis vel lobatis glaberrimis subtus pallidis, dentibus cum seta terminatis; petiolis 1–2.5 mm. longis gracilibus canaliculatis supra minute viscidulo-villosis; stipulis conspicuis oblique acuminateque lanceolatis vel oblongo-lanceolatis 8–13 mm. longis 2–4 mm. latis longe sparseque ciliatis; pedunculis gracilibus 2–6 cm. longis 2–4-floris unilateraliter congesti-floris, ab axillis superioribus orientibus; calycibus ca. 4 mm. longis conspicue ciliatis sparse setosis, fructiferis ca. 4.5 mm. latis, lobis ovatis acutis ca. 2.5 mm. longis; pedicellis 0.5–1 mm. longis; bracteolis 3 lineari-filiformibus 3–4 mm. longis; corollis ochroleucis (in sicco rosaceis) ca. 3.5 mm. longis; tubo staminali 2–2.5 mm. longo; stylo ca. 1.2 mm. longo, lobis 10–13 glabris non dilatatis; stigmatibus capitellatis lobo styli vix crassioribus minute pubescentibus; carpellis glabratis valde rugosis 1–1.5 mm. longis.—PERU: hillsides on the southern slope of Chachani Mountain near Arequipa, 2100 m. alt., March 1920, *Mr. & Mrs. F. E. Hinkley 43* (TYPE, Gray Herb.).—A very distinct annual species, well marked by its glabrous herbage, three-parted lacerate-dentate leaves, and conspicuous stipules. In Baker's synopsis, Jour. Bot. xxix. 168 (1891), it falls with *M. peruvianum* (L.) Gray, a species from which it is clearly distinct. It is a pleasure to be able to name this and the previous species in honor of Mr. and Mrs. F. E. Hinkley, who in 1920, during their hours of recreation while connected

with the Arequipa Station of the Harvard College Observatory, made on the southern and lower slopes of the volcano of Chachani (about 10 km. north of Arequipa) a small but highly interesting plant-collection which has materially enriched the Gray Herbarium with well prepared material of many new or rare species.

Malvastrum arequipense, sp. nov., annuum herbaceum simplex erectum 5–20 cm. altum stellato-setosum gracile; foliis paucis oblongo-ovatis 3-lobatis sinuato-dentatis 1–3 cm. longis 8–15 mm. latis stellato-setosis basi obtusis; petiolis 3–13 mm. longis pubescentibus; stipulis lineari-lanceolatis ca. 3.5 mm. longis acutis; pedunculis gracilibus 1–3 cm. longis unilateraliter 2-6-floris ex axillis superioribus orientibus; calyce 4–5 mm. longo stellato-setoso, fructifero 4–5 mm. lato, lobis 2–3 mm. longis ovatis acutis; bracteolis 3 lineari-filiformibus ca. 2 mm. longis; pedicellis setosis 0.5–1 mm. longis; corolla 4 mm. longa in sicco rosacea, lobis obovatis rotundatis; tubo stamineo 2 mm. longo; antheris 8–10; stylis ca. 1.5 mm. longis ca. 0.5 mm. longe connatis glabris linearibus; stigmatibus capitellatis hirtellis quam styli ramus paullo crassioribus; ovarii loculis 15–18; carpellis oblongo-ovatis 1–1.2 mm. altis ca. 1.5 mm. longis, sinu angusto longo, lateribus medium versus reticulato-rugosis marginem versus crasse rugosis, dorso sparse stellatis marginem versus saepe breviter cristatis, apice cum appendicula aristata hirsuta 2–3 mm. longa subpersistenti ornatis; spermatibus brunneis laevibus compressis pedicellato-ovatis vel cum sinu obliquo.—PERU: hillside on the south slope of Chachani Mountain near Arequipa, alt. 2100 m., March 1920, *Mr. & Mrs. F. E. Hinkley 43a* (TYPE, Gray Herb.).—In Baker's synopsis of the *Malvaceae*, Jour. Bot. xxix. 168 (1891), this species falls with *M. bolivianum* Baker, but that has much larger petals, much larger pinnatifid leaves, biaristate carpels, and taller growth.

Malvastrum congestiflorum, sp. nov., annuum herbaceum 1–3 dm. altum subsimplex; caulibus flexuosis decidue stellato-tomentosis apicem versus dense lanuginosis; foliis opacis sparse stellatis rhomboideo-ovatis acutis elobatis triplinerviis grosse sinuato-dentatis basin versus integris 2–5 cm. longis 1.5–3 cm. latis basi cuneatis, rare foliis palmato-trilobatis 2.5–4 mm. latis basi obtusis lobis obovatis grosse pauceque obtusidentatis; petiolis 5–20 mm. longis stellatis; stipulis ca. 5 mm. longis lanceolatis; floribus in glomerulos densos sessiles terminales 4–8-floros congestis; calyci ca. 5 mm. longi tomentosi lobis ovatis acutis ca. 3.5 mm. longis; bracteolis 3 linearibus 3–4 mm. longis; corolla pallida ca. 4 mm. longa calycem vix superante, lobis obovatis rotundatis 2.5–3 mm. longis; tubo stamineo 1.5 mm.

longo sparse longeque villoso; columna styli glabra ca. 1.5 mm. longa, lobis ca. 8 filiformibus 0.5–0.7 mm. longis sparse villosulis; stigmatibus capitellatis; ovario depresse globoso dense stellato-tomentoso; fructu ignoto.—PERU: rocky ravines on the south slope of Chachani Mountain near Arequipa, alt. 2745 m., March 1920, *Mr. & Mrs. F. E. Hinkley 37* (TYPE, Gray Herb.).—Apparently related to *M. tarapacanum* (Phil.) Baker, but distinguished by its larger green, rather than tomentose, foliage, pale corollas, and non-aristate fruit.

Malvastrum Shepardae, sp. nov., annuum humile herbaceum stellato-setosum 2–6 cm. altum multicaule; caulibus erectis vel decumbentibus teretibus viscido-villosis setosis; stipulis scariosis ciliatis 3–4 mm. longis 0.8–1 mm. latis; foliis subsemiorbicularibus vel late ovatis 1–2.5 cm. latis 1–2 cm. longis palmate lateque trilobatis vel irregulariter dentatis setosis subtus pallidioribus prominenter nervatis basi truncatis vel obtusis; petiolis 1–3 cm. longis; floribus axillaribus solitariis 2–5 mm. longe pedicellatis; calycibus ca. 5 mm. longis setosis, lobis oblongo-lanceolatis ca. 3.5 mm. longis acutis, fructiferis 5–6 mm. latis; bracteolis duabus 0.5–0.9 mm. infra calycem locatis; corollis purpureis ca. 5 mm. longis sepala ca. 1 mm. superantibus; tubo staminеo 1.5 mm. longo; stylo ca. 1.5 mm. longo, lobis ca. 1 mm. longis glabris vix dilatatis; stigmatibus capitellatis glabris; carpellis ca. 2.5 mm. longis 1.5 mm. latis glabris ovatis valde rugosis. —PERU: in meadows, Puno, Dec. 1919, *Mrs. R. S. Shepard 123* (TYPE, Gray Herb.).—Apparently a relative of *M. pygmaeum* (Remy) Gray, but differing from the description of that species in its acute calyx-lobes, pedicellate flowers, more numerous stamens, and glabrous fruit. Perhaps also related to *M. mollendöense* Ulbrich, but differing from the diagnosis of that species in having larger stipules, shorter pedicels, smaller flowers, smaller glabrate calyces, and leaves which are merely dentate or have three broad shallow palmate lobes. In naming this species for the collector it is a pleasure to give recognition to the botanical work of Mrs. Shepard who, in company with her husband, has for some years diligently prepared for the Gray Herbarium excellent specimens of the floras visited during her missionary work in the region west of Lake Titicaca and in Tacna-Arica.

Malvastrum catamarcense, sp. nov., annuum herbaceum stellatum 8–20 cm. altum basin versus longe ascendenterque ramosum; foliis 2–3.5 mm. longis 1.3–3 cm. latis rhomboideo-ovatis irregulariter inciso-serratis vel crenato-serratis, subtus pallidioribus dense stellatis prominenter nervatis supra plerumque setosis nervis immersis, basi truncatis vel late subcordatis, apice obtusis; stipulis lanceolatis 2–3

mm. longis; petiolis 1–2.5 cm. longis; inflorescentiis axillaribus, pedunculis gracilibus 8–16 mm. longis 1–3-floris; calycibus cupuliformibus ca. 4 mm. longis infra medium partitis lobis uninerviis stellato-setosis 2–3 mm. longis anguste acuteque ovatis; bracteolis lineari-filiformibus 2–3 mm. longis; petalis albis vel dilute rosaceis quam sepala 1/5–1/3 longioribus 3–3.5 mm. longis; tubo stamineo 2.5 mm. longo; stylo ca. 2 mm. longo, lobis 6–7 ca. 0.5 mm. longis glabris vix dilatatis; stigmatibus subcapitellatis glabris; ovario glabro; carpellis maturitate reniformibus glabris 2 mm. longis 1.2 mm. latis ca. 0.9 mm. crassis dorso convexis rugosis lateraliter laevibus; seminibus glabris reniformibus 1.2 mm. longis 9 mm. latis minute faveolatis brunneis.—ARGENTINA: El Candado, Dept. of Andalgalá, Prov. of Catamarca, Sept. 2, 1916, *Pedro Jörgensen 1388* (TYPE, Gray Herb.).—A very distinct addition to the rather small assemblage of annual Malvastrums. In Baker's synopsis of the *Malvaceae*, Jour. Bot. xxix. 168 (1891), the species falls with *M. peruvianum* (L.) Gray, from which it is unquestionably distinct differing in habit, cut of leaf, calyx, and pubescence. The conspicuous, slender, very few-flowered peduncles of *M. catamarcense* will usually serve to distinguish it.

Malvastrum Jorgensenii, sp. nov., annuum; radice erecta simplici, radicellis fibrillatis divaricatis; caulo erecto gracili subsimplici 4–6 dm. alto ad 3 mm. crasso basin versus suffruticuloso apicem versus folioso decidue stellato-tomentoso; foliis ovatis paucis acutis sparse stellatis 3-lobatis 4–7 cm. longis 3.5–5 cm. latis basi truncatis vel subcordatis subtus pallidioribus cum nervis prominentibus margine serrato-crenatis; petiolis 1.5–2.5 cm. longis; stipulis lanceolatis 1–2 mm. longis; inflorescentia terminali 10–30-flora congeste corymbosa; calyce dense stellato-tomentoso ca. 5–6 mm. longo, lobis deltoideis acutis 3–4 mm. longis, bracteolis linearibus 2–3 mm. longis; petalis laete roseis (in sicco coeruleis) ca. 1 cm. longis ca. 5 mm. latis oblongo-obovatis rotundatis quam calyx 2–3-plo longioribus; tubo stamineo ca. 6–7 mm. longo; stylo 2–2.5 mm. longo, lobis ca. 2 mm. longis stigma versus subdilatatis glabris; stigmatibus oblongo-capitellatis; ovario dense stellato-tomentoso cylindrato-globoso; fructibus ignotis.—ARGENTINA: near Suncho, Prov. of Tucuman, Sept. 5, 1915, *Pedro Jörgensen 1389* (TYPE, Gray Herb.).—Distributed as *M. peruvianum* (L.) Gray, and somewhat resembling that species in its subsimple habit. The new species has, however, smaller stipules, a tomentose rather than stellate-setose pubescence, and conspicuous corymbose rather than small unilaterally racemose flowers. *Malvastrum Jorgensenii* suggests *M. capitata* (Cav.) Griseb. in its floral structures, but that is a branched and densely tomentose shrubby perennial.

Monnina ramosa, sp. nov., fruticulosa 15–20 cm. alta laxe ramosa paullo canescens adpresse compresseque albo-villosa ut videtur furfuracea (?) annua; foliis lanceolato-linearibus 15–25 mm. longis 1.5–2.5 mm. latis obtusis integerrimis concoloribus basi attenuatis; petiolis 0.5 mm. longis; stipulis nullis; inflorescentia racemosa 5–10 cm. longa ca. 1 cm. longe pedunculata ramulos laterales terminanti pedicellis ca. 0.7 mm. longis; sepalis ciliato-fimbriatis duobus inferioribus ovatis acutis basim versus connatis ca. 1.7 mm. longis, superiori lanceo-ovata 2 mm. longa; alis albis oblique obovatis 4–4.5 mm. longis 2–2.2 mm. latis basi deltoideis; carina (in sicco) aurea emarginata orbiculari plicata a latere visa oblonga 4–5 mm. longa ca. 2.5 mm. alta obtusa; petalo superiori albo obtuso ligulato; androecio paullo ciliolato; staminibus 8; ovario glabro; stigmate inferiori tuberculato horizontali; samara oblique obovata membranacea in lateribus medium versus dense albo-strigosa, ala undulata evidenti.—PERU: on sandy pampa at 3300 m. alt. on south slope of Chachani Mountain near Arequipa, March 1920, *Mr. & Mrs. F. E. Hinkley 13* (TYPE, Gray Herb.).—Related to *M. Weberbaueri* Chodat, Engler Jahrb. xlii. 102 (1908), a species of central Peru, from which it differs in its more elongate narrower leaves, glabrate stigma, and differently shaped floral keel.

Oenothera verrucosa, sp. nov., annua herbacea pilosa erecta simplex foliosa 5–25 cm. alta; foliis 2.5–6 cm. longis 5–9 mm. latis inconspicue undulatis vel denticulatis concoloribus marginem versus pubescentibus, infimis spathulato-oblanceolatis petiolatis, superioribus lanceolatis sessilibus basi rotundatis vel cordatis; floribus axillaribus; alabastro erecto ellipsoideo villoso ca. 1 cm. longo; hypanthio infundibuliformi usque ad ca. 3 mm. longo paullo longiori quam lato; sepalis in alabastro apice libris, anthesi separatim reflexis lineari-lanceolatis; petalis luteis obcordatis ca. 5 mm. longis ca. 3 mm. latis; staminibus glabris ut videtur 2-seriatis; antheris anguste oblongis dorsaliter medium versus adfixis; stylo glabro ca. 3 mm. longo; stigmate 4-lobato lobis ligulatis 1–1.3 mm. longis; ovario viscido-villoso; capsulis 15 mm. longis 2–3 mm. crassis sparse villosis oblanceolato-fusiformibus obtusi-quadrangularibus, valvis verrucosis mediaaliter longitudinaliterque costatis; seminibus erectis uniseriatis ellipsoideis pallidis 1–1.4 mm. longis vix rugosis.—PERU: ravines and rocky slopes at 3600 m. alt. on southern slope of Chachani Mountain near Arequipa, March 1920, *Mr. & Mrs. F. E. Hinkley 17* (TYPE, Gray Herb.).—Certainly a near relative of *Oe. coquimbensis* Gay, from which it differs in its narrower more elongate leaves, and short

hypanthium. From descriptions it seems to be also closely related to the Chilian *Oe. bracteata* Phil.,'but it differs from that in having a lower stature, more elongate leaves, smaller flowers, and a sparse villous pubescence. The new species is locally known a "chochillo," and is used for urinal troubles.

Jarrilla, nom. nov. *Mocinna* La Llave, Registro Trimestre i. 351 (1832); not *Mocinna* Lag. Gen. et Sp. Pl. Nov. 31 (1816); nor *Mozinna* Ort. Nov. Pl. Descr. Decad. 104 (1798).—The generic name given by La Llave is not only later than the exactly homonymous one proposed by Lagasca, which is now referred to *Calea*, but is later also than the practically homonymous one published by Ortega. La Llave and Ortega both dedicated their names to Don José Mociño, latinizing the latter's name slightly differently. Ortega's genus has been accepted as valid by some recent authors and has appeared in print, at least once, Benth. Pl. Hartw. 9 (1839), spelled "*Mocinna*." I am therefore discarding the generic name given by La Llave, since it is essentially homonymous, being the same in origin and intent, and since its acceptance would lead to confusion. The generic name substituted is formed from one of the vernacular names given by La Llave. The genus *Jarrilla* evidently belongs to the *Caricaceae* and its recognition adds a fourth well-marked genus to the family. It appears to be most closely related to *Carica*, but differs in having low herbaceous stems, tuberous-thickened roots, and cornutely appendaged fruit. Ramírez, Anal. Inst. Med. Nac. Mexico i. 209–211 (1894) and Naturaleza ser. 2, ii. 449–450 (1894), has excellently shown the numerous characters of the genus by means of a tabular comparison.

Jarrilla heterophylla (La Llave), comb. nov. *Mocinna heterophylla* La Llave, Registro Trimestre i. 351 (1832); Naturaleza ser. 1, vii. append. 70 (1887). (?) *Carica nana* Benth. Pl. Hartw. 288 (1848). *M. heterophylla*, var. *Sesseana* Ramírez, Anal. Inst. Med. Nac. Mexico i. 207, t. 1–4 (1894); Naturaleza ser. 2, ii. 447, t. 25–26 (1894). *C. caudata* Brandg. Zoe iv. 401 (1894).—The type of this very variable species is said to have come from Guanajuato, Mexico. Its description agrees well with the plates of Ramírez's variety *Sesseana* which presumably was based upon cultivated material from Guanajuato furnished by Dugès. The species as here accepted is quite variable as to foliage. The Jalisco plant figured as typical *M. heterophylla* by Ramírez has sagittate or definitely hastate leaves and may be distinct. I have seen a quite similar plant collected at La Palma, Jalisco, in 1892 by M. E. Jones (no. *7331a*). The type of Brandegee's species comes from the mountains of southern Lower California.

Jacaratia costaricensis, sp. nov., dioica arborea pyramidalis; ramis brunneis aculeatis; aculeis acutis duris ca. 2 mm. altis conicis vel lateraliter compressis; foliis herbaceis longe petiolatis digitatis ambitu rotundatis 10–15 cm. diametro; petiolis 10–16 cm. longis; foliolis 5–7 oblanceolatis integerrimis acuminatis, supra viridibus subtus densissime glaucis; foliolo centrali 6–11 cm. longo 2–3 cm. lato cum petiolulo 2–3 mm. longo; inflorescentiis masculis axillaribus petiolo brevioribus 6–12 cm. longis laxe racemosi-paniculatis multifloris, femineis axillaribus erectis longe pedunculatis unifloris; floribus masculis ca. 17 mm. longis extus glaucissimis, in alabastro tenuiter clavatis, lobis ca. 7 mm. longis linearibus subobtusis, tubis tenuiter cylindratis ca. 1.2 mm. crassis intus sparse villosis, staminibus extus strigosis valde inaequalibus, filamentis conspicue connatis, antheris similibus sine connectivo ligulato, processis erectis spiniformibus; floribus masculis ca. 2.7 cm. longis glaucis, tubo ca. 2 mm. longo ca. 6 mm. crasso.—Costa Rica: forest of Las Vueltas, Tucurrique, 650–700 m. alt., Dec. 1898, *Adolfo Tonduz 12881* (type, Gray Herb.).—*Jacaratia costaricensis* is evidently a close relative of the Guianian, *J. spinosa* (Aubl.) DC., but differs from that species in its longer (5–9 mm. long) fruiting peduncles, and very strikingly bicolored foliage. The new species is quite unique in the genus on account of its excessively glaucous flowers and lower leaf-surfaces. The vernacular name given by Senior Tonduz is "papayillo de venado."

Pileus mexicanus (A. DC.), comb. nov. *Jacaratia mexicana* A. DC. Prodr. xv. pt. 1, 420 (1864); Calq. Fl. Mex. t. 1163–1164 (1874). *J. conica* Kerber, Jahrb. Bot. Gart. Berlin ii. 282, t. 9 (1883). *Carica heptaphylla* Sesse & Moc. Pl. N. Hisp. 172 (1887); not Vellozo (1827). *P. heptaphyllus* Ramírez Anal. Inst. Med. Nac. Mexico v. 28, t. 1–4 (1901); Naturaleza ser. 2, iii. 707, t. 41–45 (1903).—In its alate or strongly costate fruit and in its quite anomalous habit this species differs strikingly from all other members of the *Caricaceae*, and appears to merit well the generic rank accorded it by Dr. Ramírez. There are, however, two names older than the particular one taken up by Ramírez; the above combination being the proper one. The species has been almost universally referred to *Jacaratia*, but in habit it is anomalous in that genus and in addition differs in having unarmed branches and non-connate stamens. The plant differs from *Carica* in its habit, divided leaves, costate or angled fruit, and oppositisepalous corolla-lobes. It differs from *Jarrilla* in its habit, 5-celled costate or alate non-cornute fruit, divided leaves, oppositisepalous corolla-lobes, and linear (not lingulate) glabrous stigmas. Ramírez

reports the plant from the state of Morelos and Guerrero. Kerber collected it in Colima and mentions a collection from Campeche. I have seen a specimen (*Millspaugh 96* in part, mixed with *Jatropha Gaumeri* Greenm.) from between Merida and Izamal, Yucatan.

Caiophora (§ **Bicallosae**) **Jorgensenii**, sp. nov., volubilis; foliis oblongis vel late lanceolatis acutis pinnatisectis vel pinnatilobatis 2.5–5.5 cm. longis 1–3 cm. latis 3–6 mm. longe petiolatis, lobis acutis oppositis vel subalternis serratis; floribus axillaribus solitariis 5-meris; pedicellis florigeris tortuosis 10–15 mm. longis, fructiferis ca. 25 mm. longis apicem versus cernuis; hypanthiis hirsutis graciliter cylindratis ad basin sensim attenuatis ca. 8 mm. longis ca. 2 mm. crassis, lobis linearibus ca. 4 mm. longis ca. 0.5–0.7 mm. latis; petalis patentibus 8–10 mm. longis late navicularibus extus setosis; squamis pubescentibus 3–4 mm. longis ca. 2–2.5 mm. latis a latere visis semilunatis a dorso ovato-oblongis sub collo callos 2 valde incrassatos decurrentes transversos gerentibus apice valde bicalloso-incrassatis, nervis 3 ad $\frac{3}{5}$ altitudinis squamae filum emittentibus, filis 3 filiformibus basin versus paullo dilatatis squamas paullo vel vix superantibus; staminodiis 2 subulatis gibbere papillosis tortuosis 4–5 mm. longis quam squama sensim longioribus; filamentis numerosis; capsulis cylindro-claviformibus inferne in pedicellum attenuatis 2–2.5 cm. longis 4–5 mm. crassis nutantibus setosis conspicue spiraliterque contortis; seminibus 0.6–1 mm. longis ca. 0.6 mm. diametro pallide brunneis faveolato-reticulatis irregulariter alatis.—ARGENTINA: El Candado, Dept. of Andalgalá, Prov. Catamarca, Jan. 16, 1916, *Pedro Jörgensen 1163* (TYPE, Gray Herb.).—This species is evidently a close ally of *C. stenocarpa* Urb. & Gilg, and *C. Arechavaletae* Urb., and has a range geographically intermediate between these species. It differs from *C. stenocarpa* in its smaller solitary axillary flowers, elongate pedicels, and evidently contorted capsules. From *C. Arechavaletae* it differs in its shorter petioles, smaller less deeply cut narrower leaves, solitary axillary flowers, and longer more slender capsules. In *C. Jorgensenii* the scales in the flower appear to be nearly intermediate between the conditions illustrated by Urban & Gilg, Monog. Loasac. t. 8, fig. 4 and 7 (1900), for its near relatives. The staminodia in the proposed species are subulate, tapering very gradually from the broadened base. About 1 mm. above the base, and slightly below the first bend, the staminodia are provided with a pair of spreading linear coarsely and densely villous appendages about 1 mm. long. Above the attachment of the appendages the pale staminodia is covered to the very tip with gibbous tuberculations.

The staminodia in *C. Jorgensenii* is hence quite different from those of *C. stenocarpa* and *C. Arechavaletae* as illustrated by Urban & Gilg, l. c. fig. 6 and 8.

Gilibertia amplifolia, sp. nov., arborea glaberrima; ramis cortice griseo spongioso tectis; foliis paucis ovatis vel oblongo-ovatis coriaceis undulatis vel sinuatis obtusis 15–18 cm. longis 9–11 cm. latis conspicue nervatis bicoloribus basi rotundatis vel abrupte cuneatis; petiolis 6–7 cm. longis; inflorescentia terminali pyramidaliter paniculata, rachibus crassis ca. 3.5 cm. longis, bracteis conspicuis latis persistentibus saepe ad 2–3 mm. longis; ramulis primariis patentibus 2.5–3.5 cm. longis inarticulatis bracteatis; pedunculis 1–3 cm. longis saepe medium vel basin versus bracteolatis; capitulis 10–20-floris; pedicellis 1.5–2.5 mm. longis; hypanthiis anguste obconicis; corollis 5-meris; alabastris subglobosis; petalis saepe ca. 2.5 mm. longis anguste triangularibus crassiusculis acutis quam stamina paullo brevioribus; ovario glabro; baccis ca. 5 mm. longis 4 mm. latis valde 5-costatis; stylis medium versus connatis apice valde recurvatis.—COLOMBIA: Santa Marta, alt. 1200 m., Feb. 1898–1901, *H. H. Smith 1778* (TYPE, Gray Herb.).—Related to *G. arborea* (L.) March., but differing in having short pedicels, paler broader leaves, and a more compound inflorescence with a thicker main axis.

Gilibertia Smithiana, sp. nov., arbor glaberrima; foliis oblongis vel elliptico-oblanceolatis 2 dm. longis 4–7 cm. latis margine obscure crenatis et involutis, basi cuneatis vel rotundatis, apice valde acuminatis, subtus pallidioribus valde nervatis; petiolis saepe 3–8 cm. longis; racemis terminalibus, rachibus 2–6 cm. longis gracilibus erectis, pedunculis gracilibus elongatis non articulatis ima basi et medium versus bracteas breves ovatas concavas acutas gerentibus; calycis late obconici lobis acutis; corolla sphaerica paullo depressa, petalis deltoideo-ellipticis acutis uninerviis crassiusculis purpureis ca. 1.5 mm. longis stamina paullo superantibus; stylis sub anthesi in conum rugosum diametro disci circiter aequantem connatis maturitate valde recurvatis; ovariis glabris; baccis globosis laevibus 5–6 mm. longis.—GUATEMALA: Cubilquitz, Dept. Alta Verapaz, alt. 350 m., Aug. 1907, *von Türckheim 11407* (TYPE, Gray Herb.); Aug. 1901, *von Türckheim 7882.* HONDURAS: San Pedro Sula, Dept. Santa Barbara, alt. 500 m., *Thieme 5253.* MEXICO: Misantla, Vera Cruz, Aug. 1912, *Purpus 5917;* (?) Cerro del Boqueron, Chiapas, June 1914, *Purpus 7363.*—Related to the Antillean *G. arborea* (L.) March. under which name it has been distributed by Captain John Donnell Smith and treated in his key, Bot. Gaz. lv. 436 (1913), to the Central American species of

the genus. *Gilibertia Smithiana*, however, differs from its West Indian relative in having smaller flowers in a more slender less projected inflorescence, and in possessing less firm usually more elongate leaves. The only specimen of *G. arborea* in the Gray Herbarium from Central America is *Fendler 131* from Panama.

Gilibertia eurycarpa, sp. nov., arborea; ramis cortice griseo longitudinaliter sulcato tectis; foliis glaberrimis saepe obtuse breviterque acuminatis integerrimis, subtus pallidioribus costa prominenti et nervis ascendentibus arcuatis ad basin inferioribus cum costa decurrentibus, foliis ramulorum juvenum 3–5-palmato-lobatis cum petiolis 2 dm. longis, eis ramulorum maturorum ovatis acutis vel obtusis 10–15 cm. longis 5–11 cm. latis basi cuneatis; umbellis 25–40-floris in racemum 2–5 cm. longum axillarem digestis; pedunculo 4–5 cm. longo gracili medium versus bracteis brevibus ovatis concavis acutis instructo, apice in receptaculum hemisphaericum mediocre dilatato; floribus 5-meris, pedicellis filiformibus ca. 7 mm. longis bracteolis scariosis ferrugineis brevissimis basi stipatis; tubo calycis obconico, limbo anguste triangulari 1.52 mm. longo; corolla hemisphaerica paullo depressa; petalis ovatis vel triangulari-ovatis acutis ca. 2 mm. longis; staminis filamento flexuoso petalis longiore; stylis valde arcuato-reflexis basin versus connatis; bacca oblate globosa ca. 5 mm. longa cum exocarpio corrugato; pedicellis 8–10 mm. longis.—MEXICO: Tamasopo Canyon, San Luis Potosi, *Pringle 3723* (TYPE, Gray Herb.); Gómez Fárias, Tamaulipas, ca. 350 m. alt., *Palmer 275, 312*.—The species is related to *G. stenocarpa* Donn. Sm. of Guatemala and Salvador, but differs in its globose fruit, shorter style, and more uniform leaves. It is also a close relative of *G. insularis* Rose of the Tres Marias Islands, but differs from the description of that species in having larger looser inflorescence with longer pedicels and peduncles, and in having larger fruit and strongly recurved styles.

Gilibertia alaris (C. & S.), comb. nov. *Hedera alaris* C. & S. Linnaea ix. 605 (1835).

Gilibertia darienensis (Seem.), comb. nov. *Dendropanax darienense* Seem. Jour. Bot. ii. 300 (1864).

Gilia chachanensis, sp. nov., glabra glandulosa 15–20 cm. alta stricte vel ascendenter ramosa suffruticulosa (?) annua; ramis numerosis, inferne pallidis nudis, superne brunnescentibus vel viridibus gracilibus rigidusculis foliosis; foliis 1–2 cm. longis integris vel palmatifidis vel varie pinnatifidis, lobis paucis linearibus 0.5–1 mm. latis 5–18 mm. longis compressis vix dilatatis firmiusculis cuspidatis sparse glandulosis; floribus foliis oppositis solitariis; pedicellis ascendentibus

1–3 (saepius 2–3) cm. longis glandulosis; calyce campanulato viscido-glanduloso 4–5 mm. alto ca. 2 mm. crasso, lobis triangulari-lanceolatis ca. 1.5 mm. longis; corolla glaberrima ca. 9 mm. longa hypocrateriformi, tubo calycem paullo superanti albo, lobis ovalibus ca. 2.5 mm. longis purpurascentibus; staminibus infra medium tubo corollae adfixis; filamentis tubum corollae superantibus filiformibus 3.5 mm. longis; antheris orbicularibus 0.3–0.4 mm. diametro basi adfixis; stylo 2 mm. longo; stigmatibus lanceolatis ca. 1 mm. longis; loculis ovarii multiovulatis; capsula cylindrato-ovoidea 4–5 mm. longa sepalis paullo breviori polysperma; seminibus brunneis oblongis sub aqua spirilliferis.—PERU: on a sandy pampa at 3300 m. alt. on the south slope of Chachani Mountain near Arequipa, March 1920, *Mr. & Mrs. F. E. Hinkley 25* (TYPE, Gray Herb.).—The above species belongs to the § *Eugilia* and is clearly a member of that small group of South American species centering around *G. laciniata* R. & P. In Brand's monograph, Pflanzenr. iv. Fam. 250, 95 (1907), it keys out with *G. laciniata*. It differs from that, however, in its very slender glabrous habit, long filaments, solitary long-pedicellate flowers, and linear or simply cleft very slender elongate glabrous leaves. The stems of *G. chachanensis* are very slender, rather rigid, and towards the ground slightly fruticulose. The plant is absolutely glabrous but is sprinkled over with short-stipitate glands, and the upper parts are somewhat viscid. It bears the local name of "romerito del cerro."

Patima formicaria, sp. nov., fruticosa ca. 2.4 dm. alta; caulibus 1–5 erectis simplicibus fistulosis tetragonis obtuse angulatis 8–12 mm. crassis in lateribus longitudinaliter sulcatis; foliis herbaceis obovato-ellipticis vel late oblongeque obovatis 30–45 cm. longis 12–17 cm. latis integerrimis apice cum acumine 15–25 mm. longo falcate acuminatis basi cuneatis vel attenuatis subtus pallidis sparse puberulentis, nerviis 30–40 arcuate laxeque ascendentibus; petiolis 4–7 cm. longis lateraliter compressis angulatis; stipulis 4–5 mm. longis lineari-attenuatis vel lanceolatis crassis; inflorescentia glabra axillari; axillis cum 1–3 uni- vel quadri-floris 1 mm. longe pedunculatis umbellis ornatis; pedicellis 4–8 mm. longis; hypanthio glabro hemisphaerico ca. 2 mm. alto; ovario multiovulato multiloculari (?); calyce glabro integro 1.5–2.5 mm. alto cupuliformi; corolla 2.5–2.8 mm. longa firma citrea vel (in saltem sicco) rubiginosa extus glabra, tubo cylindrico ca. 1.5 mm. longo ca. 4 mm. crasso intus glabro supra in fauces infundibuliformes 8–10 mm. longas usque ad 8–10 mm. crassas intus aureo-villosas ampliato, lobis deltoideis ascendentibus graciliter acuminatis in alabastro paullo lateraliter imbricatis ca. 3.5 mm. latis; staminibus glabris inclusis in

faucibus ad corollam affixis; filamentis ligulatis paullo attenuatis 2–2.2 mm. longis; antheris lanceo-linearibus ca. 4 mm. longis basi emarginatis apice acuminatis; stylo corolla breviori tereti glabro ca. 1.5 mm. longo, stigmatibus ligulatis ca. 2.7 mm. longis; bacca 6–7 mm. crassa 5–8 mm. alta; seminibus subglobosis brunneis ca. 0.5 mm. diametro foveolatis.—British Guiana: Tumatumari, Potaro River, lat. 5° 20′ N., June 1920, *Hitchcock 17348* (type, Gray Herb.); clayey hills at mouth of Merumé Creek, 5° 53′ N., 59° 52′ W., Dec. 1922, *H. O. Lang 330* and *339*.—Evidently related to *P. guianensis* Aubl., Pl. Guian. 196, t. 77 (1775) and Hoffm. in Mart. Fl. Brasil. vi. pt. 6, 309 (1889), but having taller tetragonal stems, larger long-acuminate leaves, larger flowers, and smaller apparently many-celled fruit. According to Dr. W. M. Wheeler, to whom the Gray Herbarium is indebted for excellent material of the species, the plant is myrmecophilous, its fistulous stems being the habitation of at least five species of ants.

Gnaphalium microcephalum Nutt. Trans. Am. Philos. Soc. ser. 2, vii. 404 (1841). *G. bicolor* Bioletti, Erythea i. 16 (1893).—A photograph of the type of Nuttall's *Gnaphalium microcephalum* has been recently received from the British Museum. A study of this photograph shows conclusively that the species has been universally misinterpreted and that it clearly represents the species well known to Californian botanists as *G. bicolor* Bioletti. The species of Southern California which has been mistaken for the Nuttallian species is hence without a name and may be called:—

Gnaphalium albidum, sp. nov., perenne 5–9 dm. altum; caulibus numerosis dense tomentosissimis laxe ramosis, foliis oblanceolatis vel spathulatis late adfixis saepe subdecurrentibus 3–5 cm. longis 5–10 mm. latis acutis tomentosis supra paullo viridioribus; capitulis 5–6 mm. altis ca. 4 mm. diametro in glomerulos lanugineos terminales congestis; tegulis ca. 18 albidis 3-seriatis, exterioribus ovatis acuminatis, interioribus oblongis acutis; floribus perfectis 3.5 mm. longis 5–6, imperfectis 35–40; pappi setis ca. 20 distinctis ca. 4 mm. longis barbatis; achaeniis glabris oblongis ca. 0.6 mm. longis.—California: in the chaparral, Granite, San Diego Co., 550 m. alt., July 11, 1916, *Mary F. Spencer 69* (type, Gray Herb.); grassy hillside, Laguna Mts., San Diego Co., *Spencer 1034;* border of stream, San Bernardino Mountains, *Parish Bros. 579;* Pasadena, *Grant 518;* Mission Canyon, Santa Barbara Co., *Eastwood 124*.—This species is confined to the coastal drainage of Southern California where it is most common in gravelly places on the alluvial fans along the base of

the mountains, and in open places in the chaparral belt in the foothills or at low altitudes in the mountains. It is probably most related to *G. Wrightii* Gray, a species of northern Mexico and New Mexico, which has smaller heads, more acute tegules, more slender stems, and a much less dense tomentum on its stems and foliage.

GNAPHALIUM BENEOLENS Davidson, Bull. So. Calif. Acad. Sci. xvii. 17 (1918).—LOWER CALIFORNIA: San Vicente, *Orcutt 1241*. CALIFORNIA: Saratoga, San Diego Co., *Spencer 166;* Palomar, *Spencer 1043;* Crescenta, *Burlew 3275* (ISOTYPE); Converse Basin, Fresno Co., *Dudley 3397;* Yosemite, 1877, *Hooker & Gray;* Del Monte, *Elmer 4038;* Black Mt., Santa Clara Co., *Baker 1542;* Mt. Tamalpais, *Eastwood 1501;* near Forest Ranch, Butte Co., *Heller 12659*. NEVADA: Bowers, *Heller 10659;* near Carson City, *Anderson 19*.—This species seems properly to include almost all that material from middle and northern California, and most of that from Southern California, which in the past has gone as *G. microcephalum*. It differs from *G. albidum* in its narrow linear elongate leaves and larger usually stramineous heads. In Southern California where *G. albidum* and *G. beneolens* both occur, the latter appears to flower later, to be more common, and to reach its optimum development at lower altitudes growing in the broad warm valleys and low foothills. The two species have very different habits, at least in Southern California. *Gnaphalium albidum* branches more, particularly towards the base, and has somewhat decumbent stems, and consequently has a decidedly loose habit. On the other hand *G. beneolens* is stiffly erect, with little branching towards the base, and forms close trim clumps. The difference in foliage between the species, while occasionally obscure in very mature specimens, is remarkably accentuated on the vigorous young flowerless shoots.

GNAPHALIUM THERMALE E. Nels. Bot. Gaz. xxx. 121 (1901).—WYOMING: on the formations, Norris Geyser Basin, Yellowstone Park, *Nelson 6139* (ISOTYPE). IDAHO: Lake View, Kootenai Co., *Sandberg, MacDougal & Heller 872;* Trinity, Elmore Co., *Macbride 529*. BRITISH COLUMBIA: vicinity of Nanaimo, Vancouver Isl., *Macoun 430*. WASHINGTON: New Port, *Kreager 454;* Peshastin, *Sandberg & Leiberg 830;* Friday Harbor, San Juan Islands, *Zeller 1213*. OREGON: Kamela, *Peck 4672;* Detroit, *Nelson 1912*. CALIFORNIA: near Deetz Station, Siskiyou Co., *Heller 11702;* Truckee, *Heller 7092;* Bear Valley, San Bernardino Mts., *Abrams 2888*.—Although grossly inappropriate, the above name seems the only one correctly applicable to the plant of northwestern United States now current as *G. microcephalum*. The plant in question is a well marked one and ranges from western

Wyoming to Oregon and southern British Columbia and thence southward along the Sierra Nevadas to Southern California. It appears to be most related to *G. Wrightii* of Mexico and New Mexico, but differs in its very different distribution, smaller heads, and sharply acute usually stramineous tegules. *Gnaphalium thermale* is readily distinguished from *G. beneolens* by its very conspicuously smaller heads and northern range. In California where the two latter species both occur, *G. thermale* grows on the mountains in the pine belt at altitudes much higher than *G. beneolens*.

Gnaphalium texanum, sp. nov., perenne 3–4 dm. altum; caulibus compluribus laxe ramosis dense tomentosis foliis numerosis oblanceolatis vel oblanceo-linearibus 3–7 mm. latis 1.5–4 cm. longis acutis late affixis, subtus tomentosis, supra sparse decidueque tomentosis; capitulis 4–5 mm. altis 2–2.5 mm. diametro in glomerulos lanuginosos densissimos congestis; tegulis 18–20 albidis 3-seriatis interioribus oblongis acutis, exterioribus ovatis acuminatis tomentosis; floribus perfectis 2.5 mm. longis 8–10, imperfectis ca. 40; pappi setis ca. 18 distinctis ca. 3 mm. longis subnudis; achaeniis glabris oblongis ca. 0.5 mm. longis.—TEXAS: mouth of Tarlinga Creek, Brewster County, Sept. 1883, *V. Havard 26* (TYPE, Gray Herb.); rocky soil, lower slopes, Davis Mts., Aug. 20, 1915, *without collector*.—Although passing as *G. Wrightii* Gray, this species seems unquestionably distinct, differing in its stiff habit and branching, narrow leaves, and particularly in having its small heads crowded into tight capitate clusters terminating short leafy branches. The new species appears to replace *G. Wrightii* in Texas.

Gnaphalium viridulum, sp. nov., bienne 2–4 dm. altum; caulibus compluribus erectis simplicibus vel rariter laxe ramosis tomentosis; foliis oblanceolatis superioribus gradatim reductis late affixis 2–6 cm. longis 4–10 mm. latis, apice acutis cuspidatis, subtus dense tomentosis, supra paullo viridioribus; inflorescentia dense corymbosa; capitulis 4–5 mm. altis 2–3 mm. diametro in glomerulos densos congestis; tegulis ca. 18 albidis basem versus viridulis 3-seriatis exterioribus ovatis acutis sparsissime laxeque tomentosis, interioribus oblongis acuminatis; floribus perfectis 5–6 ca. 3.5 mm. longis, imperfectis 30–35; pappi setis ca. 15 distinctis solitariter deciduis ca. 4 mm. longis antrorse hispidulis; achaeniis glabris oblongis 0.6 mm. longis.—NEW MEXICO: Bear Mts. near Silver City, 2400 m. alt., Sept. 19, 1903, *O. B. Metcalfe 742* (TYPE, Gray Herb.). ARIZONA: Gooseneck, Paradise, Chiricahua Mts., 1950 m. alt., *Blumer 2207;* Tucson, 1907, *Loyd*.—This species has been confused with *G. Wrightii* although dif-

fering in its lower stature, smaller cylindrical greenish heads, and less sharply acute partly green tegules. The plant has a characteristic habit. It appears to range more to the westward than does *G. Wrightii* and perhaps replaces it in Arizona.

GNAPHALIUM USTULATUM Nutt. Trans. Am. Philos. Soc. ser. 2, vii. 404 (1841).—It has been the current practice to apply the name *G. purpureum* L. to an indigenous plant which ranges along the Pacific Coast from British Columbia to Southern California and seemingly reappears in Arizona and northern Mexico. Comparison of this plant with the true *G. purpureum* of eastern United States shows the former to be uniformly coarser, to have a much looser tomentum, and a broader dense stout somewhat leafy spike of commonly brown heads. The plants from the two coasts are readily recognized and may be quickly separated merely on their difference of gross habit and aspect. A study of the photograph of Nuttall's type of *G. ustulatum*, recently received from the British Museum, shows that both of the specimens cited by Nuttall clearly belong to the Pacific Coast plant and hence that his name is properly applicable to the "*G. purpureum*" of Californian authors. Although Nuttall cites one specimen as collected "On the plains of the Platte, towards the Rocky Mountains" the species is not known there, and it seems almost certain that the locality is the result of mislabeling. In Southern California *G. ustulatum* is not known south of Santa Barbara and Santa Rosa Island. The specimens from San Diego and Claremont cited by Hall, Univ. Calif. Pub. Bot. iii. 111 (1907), represent the amphigean weed, *G. spathulatum* Lam., a plant readily recognized by its distinctly annual weedy habit, floccose greenish foliage, and yellowish or greenish heads embedded in tomentum.

3. A NEGLECTED PAPER BY JEAN LOUIS BERLANDIER.

It was recently discovered that the library of the Gray Herbarium contained copies of a sixteen page brochure, apparently written by J. L. Berlandier, which seems to have escaped the notice of recent authors. The title-page of the paper reads: Memorias | de la | Comision | de | limites | a | las ordenes del | General Manual de Mier y Teran. The first numbered page bears at its head: Memorias de la Comision | de limites. | Historia Natural | Botanica. | por | El General Teran y L. Berlandier. The preface is dated thus: Matamoros de las Tamaulipas Junio 20 de 1832. The commission referred to is evidently that which, according to Bancroft, Hist. Mex. v. 154 (1885), was appointed "in 1827, with General Manual Mier y Teran

as its chief, to ascertain the boundary between the Mexican and American republics under the treaty of 1819." According to Alcocer, Naturaleza ser. 2, iii. 556–557 (1901), the commission operated as late as 1830 or 1831. Since the date to the preface of the botanical report is over a year after the disbanding of the commission, it seems probable that the time mentioned is within a year, if not a month, of the exact date of publication, since the paper is a small one and especially since certain crudities in printing suggest that it was printed (in all probability very promptly) on some frontier press such as would have been found at that period in Matamores. The brochure is hence taken as having been published in 1832.

In substance the paper consists of dual Latin and Spanish descriptions of eleven newly proposed species and four new genera. The descriptions are carefully prepared and are evidently the work of Berlandier. The identification of the proposed genera and species, which appear to have been completely neglected and which are not listed in the Kew Index, has been greatly facilitated by the specimens from the Berlandier herbarium now preserved in the Gray Herbarium. These in a number of cases are labeled in Berlandier's handwriting with the names published in the brochure. Further help has been derived from the volume of Berlandier's unpublished plates, now preserved in the library of the Gray Herbarium. In the present paper these plates are cited: Berl. Icon. Ined. It seems probable that the brochures and the Berlandier manuscripts all came to the Gray Herbarium through the gift of Dr. Short under the conditions mentioned by Gray, Am. Jour. Sci. ser. 2, xxxv. 16 (1863).

Rivina vernalis Teran & Berl. Mem. Comision Limites 1 (1832); Berl. Icon. Ined. no. 1, pt. 1, t. 3, fig. 3.—"Crescit in locis sterilibus siccis humidisve, prope Matamoros de las Tamaulipas." = R. HUMILIS L. Sp. Pl. 121 (1753).

Cactus bicolor Teran & Berl. Mem. Comision Limites 1 (1832); Berl. Icon. Ined. no. 1, pt. 2, t. 4; no. 6, t. 4.—"Crescit in locis siccis sterilibusque prope Matamoros de las Tamaulipas." = **Hamatocactus bicolor** (Teran & Berl.), comb. nov. *Echinocactus setispinus* Engelm. Bost. Jour. Nat. Hist. v. 246 (1845).—Britton & Rose, Cactaceae iii. 105 (1922), say that *E. setispinus* is "very different from *Cactus bicolor* Berlandier." Berlandier's description, however, agrees very closely with their description of Engelmann's species, while pencilings on Berlandier's plates, which certainly represent the species as illustrated by Britton & Rose, show that Engelmann also considered his species synonymous soon after the publication of the latter.

CACTUS CHLORANTHUS Teran & Berl. Mem. Comision Limites 3 (1832); Berl. Icon. Ined. no. 1, pt. 2, t. 3.—"Crescit in locis sterilibus siccisve prope Matamoros de Tamaulipas." This species is a Mammillaria apparently belonging to the genus *Escobaria* of Britton & Rose, Cactaceae iv. 53 (1923).

CACTUS TAMAULIPENSIS Teran & Berl. Mem. Comision Limites 3 (1832).—"Crescit in locis sterilibus inter ripam fluvii dicti Rio Bravo del Norte et locum dictum arroyo colorado prope Matamoros de las Tamaulipas." Unrecognized.

Terania frutescens Berl. in Teran & Berl. Mem. Comision Limites 4 (1832); Berl. Icon. Ined. no. 6, t. 2.—"Habitat in regionibus septentrionalibus et orientalibus Reipublicae Mexicanae; prope San Antonio de Bejar in Texas, circa Monterrey in Nuevo Leon, prope Matamoros et Victoria in Tamaulipas." Berlandier's genus, *Terania*, is evidently a late synonym of *Leucophyllum*, but his species is some years older than *L. texanum* Benth. in DC. Prodr. x. 344 (1846). The correct name for the plant is, therefore, **Leucophyllum frutescens** (Berl.), comb. nov.

Gaza anacua Teran & Berl. Mem. Comision Limites 5 (1832); Berl. Icon. Ined. no. 4, t. 9.—"Habitat in locis siccis humidive; in Texas prope la Bahia del Espiritu Santo; in Tamaulipas prope Matamoros ubi vulgo adpellatur Anacua." The genus *Gaza*, described at the above citation, is a synonym of *Ehretia*. The species, *G. anacua*, however, is an older name for the plant current as *E. elliptica* DC. Prodr. ix. 503 (1845), which therefore should be called **Ehretia anacua** (Teran & Berl.), comb. nov.

Chrysodendron tinctoria Teran & Berl. Mem. Comision Limites 7 (1832).—"Habitat in locis umbrosis montium dictorum Sierra de Tamaulipas del norte, prope San Carlos et San Nicolas, et forsan in omnibus montibus del Nuevo Leon prope Monterrey. Vulgo Palo amarillo." The generic name *Chrysodendron* was proposed at the above reference. It is a synonym of *Mahonia*. As the specific name is much older than the synonymous *Berberis chochoco* Schlecht Bot. Zeitg. xii. 652 (1854), the plant should properly be called **Mahonia tinctoria** (Teran & Berl.), comb. nov. Three varieties of *C. tinctoria* were published, namely *oblongifolia*, *latifolia*, and *longifolia*. Authentic material in the Gray Herbarium, however, shows them to be trivial leaf-forms.

JATROPHA CATHARTICA Teran & Berl. Mem. Comision Limites 9 (1832).—"Crescit in locis sterilibus fere totius Tamaulipae, praecipue

ad margines fluvii dicti Rio de las Nuecas et prope Matamoros urbem." = *Jatropha Berlandieri* Torr. Bot. Mex. Bound. 198 (1858).

Mimosa pseudo-Echinus Teran & Berl. Mem. Comision Limites 11 (1832); Berl. Icon. Ined. no. 1, pt. 2, t. 7.—"Habitat in sylvis provinciarum internarum Orientalium prope San Luis Potosi ad ripam fluminis dicti Rio Grande usque ad Texas. Habitus Echini mollis." = PROSOPIS JULIFLORA (Sw.) DC. Prodr. ii. 447 (1825). It is evident that the specific name was meant to be "*pseudo-Schinus*" and it is so spelled on herbarium specimens. In the brochure and in the unpublished plates, however, it is spelled as given above. Standley, Contr. U. S. Nat. Herb. xxiii. 353 (1922), has commented on the spelling of the specific name.

Calia erythrosperma Teran & Berl. Mem. Comision Limites 13 (1832).—"Habitat in Texas, prope S. Antonio de Bejar urbem, in Tamaulipas inter Palmillas et Jaumave locis ruderatis." *Calia* was described as a new genus. It is, however, much later than the homonymous and universally recognized genus of the *Compositae*. The species is clearly a synonym of SOPHORA SECUNDIFLORA (Ortega) Lag. in DC. Cat. Hort. Monspl. 148 (1813).

Lantana rubra Berl. in Teran & Berl. Mem. Comision Limites 15 (1832); Berl. Icon. Ined. no. 1, pt. 1, t. 5, fig. 1.—"Habitat in Tamaulipas circa Matamoros urbem, in Tejas ad ripam maris, in loco dicto Bahia de Matagorda et prope San Antonio de Bejar urbem." This is a synonym of either L. CAMARA L. or L. HORRIDA HBK.

4. ON THE VALIDITY OF MOLINA'S SCIENTIFIC NAMES.

In the most recent addition to his list of critical papers on the flora of the Argentine, Professor Lucien Hauman, Physis vii. 67–76 (1923), has reviewed and discussed the validity of the plant-names proposed by Molina in the first (1782) edition of the "Saggio sulla storia naturale del Chili." It is surprising that Professor Hauman, admitting the priority of many of Molina's names, has refused to accept the necessary name-changes, considering the names published in the Saggio to be "nomina nuda" because they are more frequently identifiable by items of folk-lore or by philological or pharmaceutical details mentioned by Molina, than by the formal latin diagnoses. It must be admitted that Molina's botanical descriptions are very brief and are frequently inaccurate. The descriptions, however, are always accompanied by a discussion in the text of the Saggio relative to the habit and to the native names and uses of the plant treated. Such discussion, supplementing the poorly prepared technical matter,

commonly serves to identify the species positively. In the brevity of his descriptions Molina was not at all exceptional in his age, and his names are about as readily identified from their diagnoses as are the species described by Linneus in the "Systema Naturae." If we are to accept the principle upon which Professor Hauman rejects Molina's names, treating all species as nomina nuda which are unidentifiable from their original description alone, and refusing to admit any *a posteriori* evidence as to the identity of such species, then botanical nomenclature is destined to a highly undesirable and catyclismic reorganization, since most of the early species and even a goodly proportion of the recent ones, are more readily, if not exclusively, identifiable from some locality, use, or local-name mentioned, or from a study of the original material, than they are from the whole of the formal portion of the description. Consistency, therefore, demands that we accept Molina's names when they are satisfactorily identified, as most of them have been through the efforts of Philippi, Anal. Univ. Chile xxii. 699–741 (1863). It is also to be noted that most of Molina's names were considered sufficiently well identified to be cited in the synonymy of Reiche's Flora de Chile. When the identity of such names has been determined with accuracy sufficient to warrant citing them, unquestioned, in synonymy, it would seem that we are logically obliged, if our acceptance of priority be more than a pretense, to take them up if they fulfill in other respects the necessary nomenclatorial requirements. Although Molina's names were disregarded in the past, their neglect was not from their inadequate definition, but because the earlier workers on the flora of southern South America followed, more or less closely, the principle finally formulated as the "Kew Rule" which calls for the acceptance, not of the oldest specific name, but of the first specific name under the accepted generic name. While it is regrettable that well known specific names should be displaced by the neglected ones of Molina, there seems no other course for those who find their guide in the modern International Rules of Nomenclature formulated at Vienna, which call for the acceptance of the oldest specific name irrespective of the genus under which it was described. With the exception of the few changes made at this time, most nomenclatorial adjustments occasioned by the priority of Molina's names, have been made by previous writers.

Fitzroya cupressoides (Molina), comb. nov. *Pinus cupressoides* Molina, Sagg. Chile 168 (1782). *Libocedrus cupressoides* Kuntze, Rev. Gen. iii. 375 (1893). *F. patagonica* Hook. f. ex Lindl. Jour. Hort. Soc. vi. 264 (1851).

Frankenia salina (Molina), comb. nov. *Ocymum salinum* Molina, Sagg. Chile 239 (1782). *F. Berteroana* Gay, Fl. Chile i. 247 (1845).

Gomortega keule (Molina), comb. nov. *Lucuma keule* Molina, Sagg. Chile 187 (1782). *G. nitida* R. & P. Syst. Fl. Peruv. i. 108 (1798).

Larrea balsamica (Molina), comb. nov. *Mimosa balsamica* Molina, Sagg. Chile 165 (1782). *L. nitida* Cav. Anal. Hist. Nat. Madrid ii. 120 (1800).

Myrceugenia luma (Molina), comb. nov. *Myrtus luma* Molina, Sagg. Chile 173 (1782). *Myrceugenia apiculata* (DC.) Niedz. in E. & P. Nat. Pflanzenf. iii. Abt. 7, 74 (1893).

Nierembergia minima (Molina), comb. nov. *Nicotiana minima* Molina, Sagg. Chile 153 (1782). *Nierembergia repens* R. & P. Fl. Peruv. ii. 13, t. 123 (1799).

Statice guaicuru (Molina), comb. nov. *Plegorhiza guaicuru* Molina, Sagg. Chile 164 (1782). *S. chilensis* Phil. Anal. Univ. Chile xx. 58 (1861).

PROSOPIS CHILENSIS (Molina) Stuntz, U. S. Bur. Pl. Indust., Invent. xxxi. 85 (1914). *Ceratonia chilensis* Molina, Sagg. Chile 172 (1782). *P. juliflora* (Sw.) DC. Prodr. ii. 447 (1825).—As the above combination was made in an obscure place it is repeated here to call attention to the fact that it is the proper name for the widely distributed, variable, and much named species known as "mesquite" in Mexico and southwestern United States, and generally current as *Prosopis juliflora*. The combination is not given in the Kew Index, nor is ARISTOTELIA CHILENSIS (Molina) Stuntz, l. c. [= *Cornus chilensis* Molina], nor VILLARESIA CHILENSIS (Molina) Stuntz, l. c. xxxii. 39 (1914) [= *Citrus chilensis* Molina].

[Reprinted from RHODORA, Vol. 26, No. 304, April, 1924.]

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New Series.—No. LXXI

NOTES ON NORTH AMERICAN SCUTELLARIAS

BY C. WILLIAM PENLAND

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(Plates 140, 141.)

Dr. Asa Gray (Proc. Am. Acad. viii. 370), after remarking as to the placing of the genus *Scutellaria* in a subtribe, goes on to state that "The winged nutlets of *Perilomia*, however, are curiously imitated in one or two species of *Scutellaria*, only obscurely so in *S. parvula*, as has been noted by Dr. Torrey, . . . but strikingly in *S. nervosa*, Pursh, and in a Japanese species not otherwise very similar . . . ." The presence of this membranaceous wing, together with a reputed difference in shape of the corolla, is used as a basis of separation of the above-mentioned genus *Perilomia* from *Scutellaria* by Humboldt, Bonpland & Kunth (Nov. Gen. & Sp. Amer. ii. 326). Prof. Fernald (Rhodora, xxiii. 85), after examining sheets of the Old World *S. galericulata* and of the North American form, which for many years had passed as *S. galericulata*, came to the conclusion that the Old World plant is really not found as such on this side of the Atlantic, but that it has a closely related representative here. This was demonstrated chiefly by nutlet-characters, the exact significance of which will be clarified in the sequel.

These facts have combined to indicate that perhaps a critical inspection of the group in question, from the standpoint of the fruit, might serve to throw light on, if not to clear up, some well known taxonomic difficulties existing here. From an examination of over

two thousand sheets of herbarium material, it was found that the nutlet-characters indicated in a striking way the relationships of species and sections within the genus.

At this point it will be convenient to establish the generic and tribal relations of *Scutellaria*. In 1832–36, Bentham (*Labiatarum Genera et Species*) put *Scutellaria* and *Perilomia*—a South American genus—into a single tribe, but later, in 1848 (De Candolle's *Prodromus*), he added *Brunella* and *Cleonia* to these two and threw them into a sub-tribe *Scutellaricae* of the tribe *Stachydeae*. Briquet, in his treatment of the genus in Engler & Prantl's *Die Natürlichen Pflanzenfamilien*, assigns *Scutellaria* and *Salazaria* Torrey to the tribe *Scutellarioideae*, placing *Perilomia* in a separate tribe, *Stachyoideae*. It is noteworthy that in his grouping of the *Perilomia* entities he includes certain forms which other authors have put with *Scutellaria*, e. g., *S. Mociniana* Benth., and which apparently do not differ from that genus except by the alleged upright position of the seed. This special portion of the genus even has the scutellum on the calyx,—a character lacking in other sections. Undoubtedly the position of the seed is important in the classification, but its infallibility is questionable when it separates such apparently closely related forms. It is to be regretted that more material of these forms is not at hand. It is thought that the presence of the scutellum might serve as a more reliable generic character.

Scutellaria then, is characterized by its bilabiate calyx, with lips entire and closed in fruit. From the upper lip is a projection known as the scutellum. Its co-genus *Salazaria* is set off on account of its calyx which becomes swollen in fruit.

As somewhat detailed accounts of the genus, we have the earlier work of Arthur Hamilton, "Monographie du Genre Scutellaire," Bulletin Seringe, 1832, and Bentham's treatise in the work above mentioned. Both these earlier writers have seen fit to make a number of sections, separated according to the nature of the inflorescence. Bentham confessing on his part the inadequacy of these characters. Hamilton makes but three sections and includes in them fifty-two species, fourteen of which are assigned to North America. Bentham makes five sections into which sixty-three species are placed, fifteen of which are North American. Inasmuch as in the present investigation the fruit has been specially studied, and since the Old World specimens available were too infrequently fruiting for accurate observation and too scarce for authoritative judgment, it was thought

best to confine attention to North American material, exclusive of Mexico.

Interestingly enough, the sections earlier adopted in classification are, with a few exceptions, confirmed by the reproductive characters. Briquet, following the work of Gray, was evidently the first to expand on the more conservative, and therefore more reliable reproductive characters, to indicate taxonomically the natural relationships. The presence or absence of a membranaceous wing does not establish

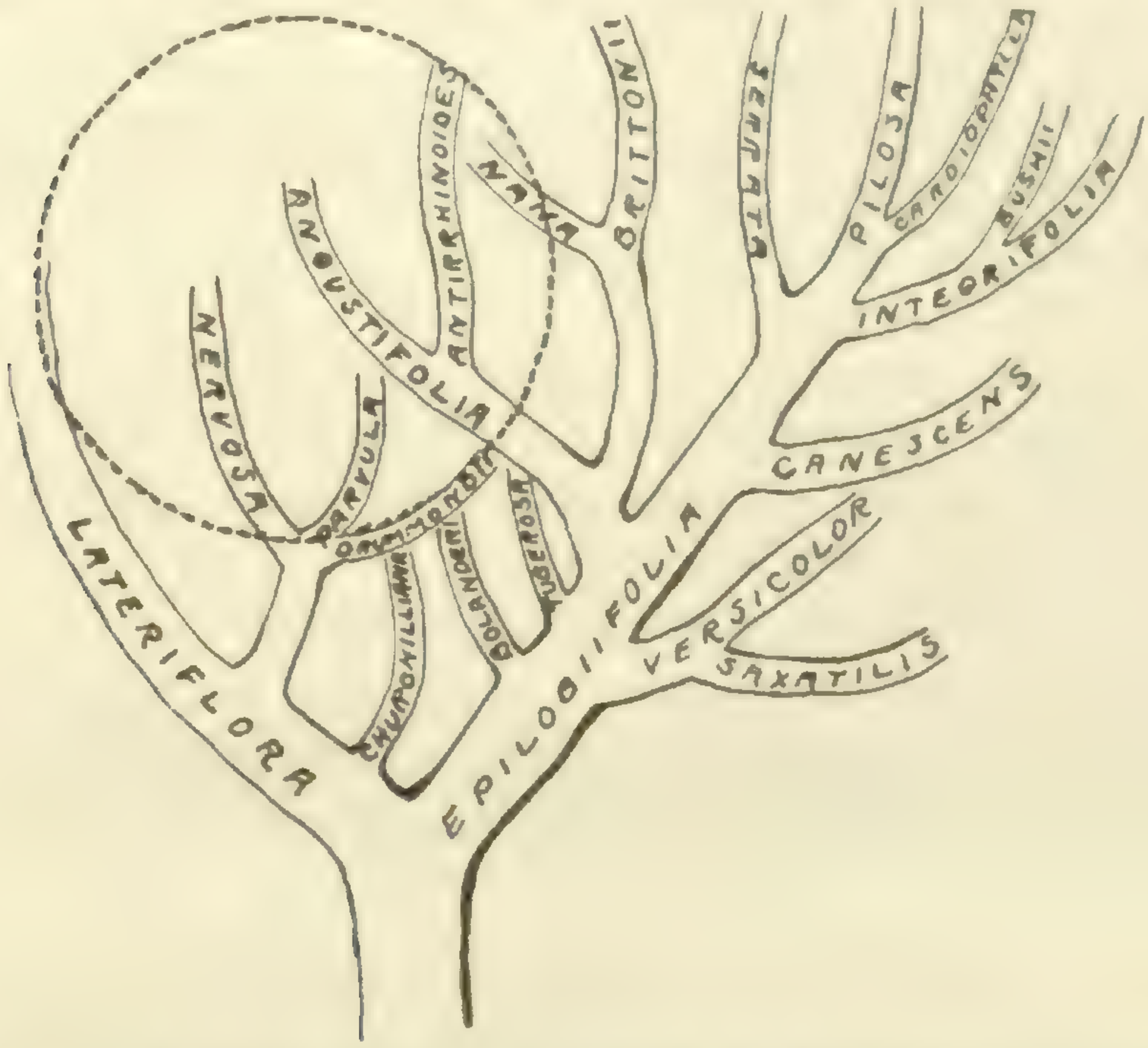


Diagram 1. Showing relation of species of Scutellaria. (Forms with winged nutlets are in the circle.)

generic differences, as indicated by Bentham, for at least three well defined American species of the genus have this wing. It is also well to remark here that the two sheets referred to *Perilomia* (*P. ocymoides*) which are found in the Gray Herbarium do not have the winged achenia attributed to the genus. Apparently, therefore, we have double evidence as justification for the discard of this character as a generic distinction. However, the membranaceous wing is important within the genus *Scutellaria* and might afford a basis for the first division into component parts in an artificial key.

It is believed that even this nutlet-character is artificial, since it apparently has been secondarily acquired, appearing as it does in several different groups. It seems beyond a doubt, that *Scutellaria*

lateriflora and *S. epilobiifolia* are nearest the ancestral branch of the phylogenetic tree (diagram 1). Both are very wide-spread in distribution. According to the diagram, as I have conceived the situation, they represent the first forks of the tree, and both have given rise to groups showing the character in question. Further, in a hasty review of nutlet-characters of the other genera of the *Labiatae*, it appears that the character referred to is absent. This is another justification for believing it is of more recent development.

The first division was taken up by Gray, later adopted by Briquet and is now in use by authors of the larger manuals in this country. Briquet introduced names for these divisions or sections. The section *Scutellariopsis* should be extended to include at least two more North American species. Hitherto *Scutellaria nervosa* has been classed as our sole representative of this group. Yet it is difficult to understand why *S. parvula*, the achene of which has a conspicuous band, amazing in its constancy, should be left out. Here too we should place the *S. angustifolia* group, one species of which has nutlets with wings rivaling even those of *S. nervosa*.

The present status of the work and the limited area covered do not justify the grouping of the species of the genus into sections. It is hoped that later a survey of the world representatives may be made, at which time such sectional characters may be properly adjudged. It is hoped also, that a study of the immediately related genera may be taken up, following the more critical reproductive characters.

The arrangement of species given below follows a more or less natural system. As arranged, numbers 1, 2 and 3; 4 and 5; 6, 7, 8, 9, 10 and 11; 12, 13, and 14; and 15, 16, 17, 18, 19, 20 and 21, form fairly well defined groups. It will be seen that they do not agree with treatments given by other students of the group. The fact that militates against this kind of grouping, of course, is that it indicates an impossible linear evolution. True relationships are better shown in the tree (diagram 1).

There remains to say a word or two upon the acceptance of nutlet-characters as a basis for the separation of sections. This can best be brought out by means of an example: Perhaps one of the best-marked groups of species, the interrelations of which are shown by nutlet-characters, is the series consisting of *S. lateriflora*, *S. galericulata* and *S. epilobiifolia*. All three have canary-yellow achenes which are not duplicated elsewhere in the genus. Of these three *S. galericulata* (I am using this Old World species for purposes of illustra-

tion) comes between the others, both from a superficial standpoint and from the characters of the nutlets. *S. lateriflora* has small papillae or wart-like protuberances on the surface of the achene, while *S. epilobiifolia* has the surface of the achene merely scabridulous. The European *S. galericulata* has nutlets closely resembling those of *S. lateriflora*, while the vegetative characters are very similar to those of *S. epilobiifolia*. The corolla of the latter exceeds by about 1 cm. that of *S. galericulata*, which attains a length of no more than 1.5 cm. From this comparative examination, based on reproductive characters, it would seem anything but following the natural system to break off *S. lateriflora* and put it into a separate section as both Bentham and Briquet have done.

I desire to record my thanks to Prof. M. L. Fernald, who has supervised this work and given invaluable advice; to Dr. B. L. Robinson, Dr. J. M. Greenman, and Mr. Bayard Long, for the loan of herbarium material of their respective institutions; to Miss Mary A. Day and other members of the Gray Herbarium staff for help rendered along various lines during the execution of the work.

The key, based upon nutlet-characters, is artificial, since, as already explained, species which seem to have come through different lines of descent are thrown together. In the citation of specimens all which are not in the Gray Herbarium are indicated by initials in parentheses: N, Herbarium of New England Botanical Club; M, Missouri Botanical Garden; P, Academy of Natural Sciences of Philadelphia.

Analytic Key based on Nutlet-Characters.[1]

A. Nutlets banded or winged, or conspicuously compressed dorso-ventrally B.
  B. Nutlets conspicuously winged C.
    C. Nutlets not over 1 mm. in diameter; wing more or less median D.
      D. Nutlets with muriculate papillae; wing relatively wide 7. *S. nervosa*.
      D. Nutlets with bluntish papillae; wing relatively narrow 6. *S. parvula*.
    C. Nutlets mostly over 1 mm. in diameter; wing somewhat basal, giving the nutlet a flattened appearance E.
      E. Nutlets with relatively narrow, unexpanded and non-membranaceous wings ..... 8. *S. angustifolia*.
      E. Nutlets with very wide, membranaceous wings. 9. *S. antirrhinoides*.
  B. Nutlets mostly merely compressed, never with conspicuous wings I.
    I. Nutlets dull yellow or grayish, with somewhat conical papillae ..... 11. *S. nana*.

[1] In the absence of mature nutlets some species have to be omitted from this key. Though in the succeeding descriptions they are placed in what appears to be their natural sequence.

I. Nutlets dull black, with somewhat tuberculate, flattish papillae.....10. *S. Brittonii.*
A. Nutlets not winged except rarely and in immature condition J.
J. Nutlets merely rugose or finely granulate-papillate K.
K. Nutlets canary yellow L.
L. Nutlets merely scabridulous, *i. e.*, with inconspicuous papillae.....1. *S. epilobiifolia.*
L. Nutlets with minute, wart-like papillae.....3. *S. lateriflora.*
K. Nutlets black or brown, finely granulate-papillate....12. *S. resinosa.*
J. Nutlets with conspicuous papillae M.
M. Nutlets yellowish or orange.....4. *S. Bolanderi.*
M. Nutlets brown or black N.
N. Nutlets with conical, more or less sharp-pointed papillae O.
O. Nutlets with very slender elongate papillae....21. *S. saxatilis.*
O. Nutlets with the papillae short, broad at base, abruptly pointed.....20. *S. versicolor.*
(Note: *S. versicolor* frequently has the nutlets orange.)
N. Nutlets with tuberous, flattened, obtuse papillae P.
P. Nutlets strikingly rosulate in appearance....16. *S. integrifolia.*
P. Nutlets not conspicuously rosulate Q.
Q. Nutlets with thin, laminate papillae.....13. *S. Drummondii.*
Q. Nutlets with thick papillae R.
R. Nutlets with irregularly disposed muriculate papillae.....5. *S. tuberosa.*
R. Nutlets with papillae regularly disposed S.
S. Nutlets about 2 mm. in diameter.....19. *S. serrata.*
S. Nutlets 1–1.5 mm. in diameter.....15. *S. pilosa.*
J. Nutlets with short, truncate papillae T.
T. Nutlets black.....14. *S. cardiophylla.*
T. Nutlets brownish U.
U. Nutlets with processes flat on top, frequently with median depression.....18. *S. canescens.*
U. Nutlets with papillae rounded on top, smooth....17. *S. Bushii.*
(Note: *S. canescens* might be looked for here; the nutlets are light brown or olive-green in color.)

1. S. EPILOBIIFOLIA Hamilton. Fig. 6. Stem simple or branched, erect, 1.5–8 dm. high, smooth or somewhat pubescent: leaves ovate or oblong-lanceolate, acuminate, sessile or subsessile, serrate, frequently purplish underneath, 1.5–6 cm. long; the upper gradually diminishing into the bracts: flowers solitary in the axils of the upper leaves; corolla with pale tube and violet-blue lips and galea, rarely pink or white, 1.5–2.5 cm. long; lower lip somewhat protruding: achenes yellow, merely scabridulous or slightly pebbled, about 1.5 mm. in diameter.—Monog. 32 (1832). *S. galericulata* of American authors, not L.—Newfoundland to British Columbia and southward to Arizona. The following specimens are representative. Newfoundland: *M. L. Fernald & K. M. Wiegand*, nos. 3930, 3929 and 6107: *B. L. Robinson & H. von Schrenk*, no. 103. Quebec: *H. St. John*, no. 90694; *J. Macoun*, no. 68667. Nova Scotia: *C. D. Howe & W. F. Lang*, no. 529; *M. L. Fernald & B. Long*, no. 22363. New Hampshire: *C. C. Stewart*, no. 4403. Massachusetts: *J. M. Greenman*, no. 2079. New York: *O. P. Phelps*, no. 805. Ontario: *J. Macoun*, no. 20850. Michigan: *J. H. Ehlers*, no. 125. Indiana:

O. E. Lansing, no. 2829. Minnesota: *M. A. Barber*, no. 7. South Dakota: *P. A. Rydberg*, no. 948. Nebraska: *P. A. Rydberg*, no. 1490. Assiniboia: *J. Macoun*, no. 5848. Montana: *F. L. Scribner*, no. 216. Wyoming: *A. Nelson & E. Nelson*, no. 6558. Utah: *S. Watson*, no. 835. Arizona: *J. T. Rothrock*, no. 245. California: *C. F. Sonne*, no. 287 (P). Oregon: *W. C. Cusick*, no. 1939a. British Columbia: *S. Brown*, no. 748.

Forma rosea (Rand & Redfield) Fernald, Rhodora xxiii. 86 (1921). *S. galericulata*, forma *rosea* Rand & Redfield, Fl. Mt. Desert, 137 (1894).

Forma albiflora (Millsp.) Fernald, l. c. (1921). *S. galericulata*, forma *albiflora* Millsp. Fl. W. Va. 428 (1892).

2. S. Churchilliana Fernald. A form intermediate between *S. lateriflora* and *S. epilobiifolia* and possibly a hybrid of these two: stems erect, branching, flexuous, the angles covered with minute ascending pubescence: flowers borne singly in the axils of the upper leaves or in axillary racemes, similar to those of *S. lateriflora*: corolla violet-blue, 1–1.5 cm. long: leaves thin, ovate, acuminate, short-petioled.—Rhodora iv. 137 (1902).—Gravelly river-thickets of Maine and adjacent New Brunswick. The following specimens are characteristic. Maine: *M. L. Fernald & B. Long*, nos. 14455 (P), 14452, 14454 and 260; *M. L. Fernald*, no. 2088; *W. W. Eggleston & M. L. Fernald*, Valley of St. Francis River, August 12, 1902; *M. L. Fernald*, Valley of Aroostook River, September 8, 1897; *K. K. Mackenzie*, no. 3590 (M); *O. W. Knight*, Veazie, August 6, 1905, and no. 100; *J. A. Cushman*, no. 2134 (N); *J. R. Churchill*, Fort Kent, July 19, 1908 (N); *Kate Furbish*, East Livermore, July & August 1896 (N), South Poland, 1893 (N), Great Diamond Island, 1888 (N), Great Chebeague Island, June 11, 1902. New Brunswick: *M. L. Fernald & B. Long*, no. 14453.

3. S. lateriflora L. Fig. 7. Erect, mostly branched, 2–6 dm. high, smooth: leaves thin, oblong-lanceolate, acuminate, serrate, rounded at the base, petioled, 3–9 cm. long: inflorescence in axillary, rarely terminal, racemes: corolla bluish to whitish, 5–8 mm. long; lips equal in length: achenes yellow, with minute papillae on the surface.—Sp. Pl. ii. 598 (1753).—River-thickets or wet shaded places, from Newfoundland to British Columbia and southward to Florida and New Mexico. The following are representative. Newfoundland: *M. L. Fernald & K. M. Wiegand*, no. 6102. Quebec: *S. F. Blake*, no. 5619; *M. L. Fernald & H. B. Jackson*, no. 12152. Prince Edward Island: *M. L. Fernald, B. Long & H. St. John*, no. 7960. Nova Scotia: *H. St. John*, no. 1443. Massachusetts: *B. L. Robinson*, no. 588. New Jersey: *Gershoy*, no 589. Pennsylvania: *A. A. Heller & E. G. Heller*, no. 653. West Virginia: *J. M. Greenman*, no. 480. Ontario: *J. Macoun*, no. 21859. Ohio: *J. M. Greenman*, no. 1399. Illinois: *Chase* (P), no. 514177. Mississippi: *S. M. Tracy*, no. 8752. Missouri: *E. J. Palmer*, no. 2651. Nebraska: *F. Clements*, no. 2781. New Mexico: *C. Wright*, no. 1538.

Oregon: *J. C. Nelson*, no. 1832. Washington: *W. N. Suksdorf*, no. 1001. British Columbia: *J. Macoun*, no. 54677.

Forma rhodantha Fernald, Rhodora xxiii. 86 (1921). A form with pinkish flowers, found in Quebec.

Forma albiflora (Farwell) Fernald, Rhodora xxiii. 86 (1921). *S. lateriflora* var. *albiflora* Farwell, Mich. Acad. Sci. Ann. Rep. xix. 249 (1917). A form with white flowers.

4. S. Bolanderi Gray. Erect, tall and very slender, virgulate or branched from below, 1.5–5.5 dm. high, leafy, pubescent or short-hairy: leaves broadly obovate, obtuse, sessile, crenate, or the upper nearly entire; corolla nearly as in *S. antirrhinoides*, but white or creamy in color and dilated at the throat, 10–15 mm. long; lips subequal: nutlets yellowish, with slender papillae.—Proc. Am. Acad. vii. 387 (1867). —River-bottoms, etc., in California from Plumas County southward.[1] The following are characteristic. *H. M. Hall*, no. 696 (M); *G. Hansen*, no. 448 (M); *C. R. Orcutt*, no. 429 (M); *A. Eastwood*, no. 4199.

Var. **californica** (Gray), n. comb. Differs from the above in being very finely puberulent, somewhat more rigid; all but sometimes the lowest pairs of leaves entire, petioled; the corolla mostly white, sometimes tinged with blue, 15–18 mm. long.—*S. californica* Gray, Syn. Fl. ii. 381 (1878). Including *S. viarum* Heller, Muhlenbergia, i. 32 (1904).—In California from Amador County northward to Tehama County. The following represent the variety. *J. D. Hooker & A. Gray*, Calaveras County, 1877; *A. A. Heller*, nos. 5786, 7020, 12379; *E. Braunton*, no. 1047 (M); *T. Bridges*, no. 304; *J. Torrey*, no. 406; *C. F. Sonne*, no. 286 (M); *A. Eastwood*, no. 1530; *M. E. Jones*, no. 13485 (M); *J. P. Tracy*, no. 2297.

This variety includes a number of forms intermediate between *S. Bolanderi* and *S. antirrhinoides*. In fact it might well be regarded as a hybrid of these two. In the main it has more of the characters of the former than of the latter and hence is referred here rather than to *S. antirrhinoides* as at first done by Gray. Fruiting material is too poorly represented for good comparison.

5. S. tuberosa Benth. Fig. 12. Mostly simple and erect, frequently with many leafy stems from a common base, or even decumbent, villous to nearly glabrous, 2.5–15 cm. high, or, when trailing, up to 3.5 dm. long: leaves villous or nearly glabrous, petioled, broadly ovate, with few coarse crenations; base rounded, truncate or sometimes cuneate: flowers short-pedicelled, solitary in the upper axils: corolla dark-blue or purple, rarely curved, 1–2 cm. long; the lips subequal: calyx villous: nutlets with projections somewhat muriculate, dark-brown when fully mature.—Lab. Gen. et Sp. 441 (1832–1836).—Foothills or valleys throughout California and southern Oregon. The following specimens are representative. California: *W. H.*

[1] One sheet is from Indian Valley, Plumas County, *J. G. Lemmon*, autumn, 1886; the rest from Amador Co. southward.

Brewer, no. 357; *C. C. Parry*, no. 338; *W. W. Jones*, no. 285; *J. G. Lemmon*, no. 338; *A. A. Heller*, no. 7288; *C. R. Orcutt*, no. 1343 (M). OREGON: *H. S. Prescott*, Grants Pass, April 5, 1912; *T. Howell*, no. 1252 (M); *E. W. Hammond*, no. 329 (M).

6. S. PARVULA Michx. FIG. 2. Erect, simple or branching, 1–3.5 dm. high, usually many-stemmed from a moniliform tuberiferous base, pubescent nearly throughout: leaves thin, greenish, oblong-ovate, much broader at the base, 0.8 to 2 cm. long, prominently nerved beneath; the upper sessile; the lower short-petioled, occasionally with few coarse teeth: flowers solitary in the upper axils: corolla 0.7–1 cm. long, blue; the lower lip longer and flaring: calyx with upper lip commonly purple: nutlets papillose with tubercles, banded, showing close relation with *S. nervosa*.—Fl. ii. 11 (1803). *S. campestris* Britton, Mem. Torr. Club, v. 283 (1894). *S. parvula*, var. *mollis* Gray, Syn. Fl. ii. 380 (1878), in part.—On richer soils of the Great Lake region and the Mississippi valley, Quebec and Ontario southward to Georgia and Texas. The following are characteristic. QUEBEC: *W. F. Macrae*, "in river St. Lawrence opposite Montreal" (M); *A. S. Pease*, no. 12940; *Mrs. Shepard*. ONTARIO: *J. Macoun*, Pelee Point, Lake Erie, August 6, 1901. MICHIGAN: ex. Herb. *E. F. Smith*, Ionia, 1877. VERMONT: *L. R. Jones & W. W. Eggleston*, Burlington, July 12, 1894. NEW YORK: *A. Wood*, Dexter. OHIO: *E. L. Moseley*, Marblehead, May 25, 1895. ILLINOIS: *H. M. Smith*, no. 5924; *A. S. Pease*, no. 12555; *J. M. Greenman*, no. 2614 (M). TENNESSEE: *E. J. Palmer*, no. 17333 (M); *S. M. Bain*, no. 38. VIRGINIA: *J. Q. A. Fritchey*, Richmond, August 28, 1888. GEORGIA: *T. J. Wray*, Augusta (P); *S. Boykin* (P). MISSOURI: *O. E. Lansing*, no. 3033; *J. Davis*, no. 3434 (M); *E. J. Palmer*, no. 5632 (M). TEXAS: *E. J. Palmer*, no. 5034 (M); *J. Reverchon*, no. 3245 (M). LOUISIANA: *E. J. Palmer*, no. 7217 (M). OKLAHOMA: *E. J. Palmer*, no. 5956 (M); *H. W. Houghton*, no. 3582½. ARKANSAS: *B. F. Bush*, no. 1435 (M).

Var. AMBIGUA (Nutt.) Fernald. Similar to above but slightly more rigid in aspect; stem and under surface of leaves usually purplish, glabrous or with very slight appressed puberulence; the upper surface of the leaves sometimes with spreading hairs; the leaves narrower and rarely toothed.—RHODORA iii. 201 (1901). *S. ambigua* Nutt. Gen. ii. 37 (1818). *S. parvula*, authors.—In drier habitats, Maine to Minnesota and southward to Texas and westward to Nebraska. The following are characteristic. MAINE: *M. L. Fernald*, no. 466; *J. C. Parlin*, no. 305. CONNECTICUT: *G. Thurber*, East Haven, 1855; *E. B. Harger*, no. 6411 (P). PENNSYLVANIA: *W. F. Detwiller*, Mercersburg, May 19, 1845 (P); *S. D. Ingram*, Harrisburg (P). NEW JERSEY: *P. Dowell*, no. 6027. DELAWARE: *W. M. Canby*, Rehoboth, July, 1878 (P). INDIANA: *A. H. Young*, Lafayette, June, 1879 (P). TENNESSEE: *A. Ruth*, Knoxville, June, 1897 (P). ILLINOIS: *S. B. Mead*, Augusta, 1845 (P); *H. N. Patterson*, Oquawka, August, 1873; *H. A. Gleason*, Rantoul, July 5, 1907. MISSOURI: *B. F. Bush* no. 336; *O. E. Lansing*, no. 2977. LOUISIANA: *J. Hale*, Alexandria

(P). Texas: *E. Hall*, no. 453 (M). Oklahoma: *G. W. Stevens*, no. 2235. Iowa: *R. Coombs & C. R. Ball*, no. 569 (M). Kansas: *J. B. Norton*, no. 411 (M). Nebraska: *H. J. Weber*, Lincoln, June, 1890 (M). South Dakota: *H. O. Powell*, White Rock, June, 1902. Minnesota: *E. P. Sheldon*, Princeton, July, 1892.

7. S. nervosa Pursh. Fig. 1. Very slender, mostly simple, but frequently branched, 1.5 dm. high: internodes separating widely the opposite pairs or leaves: leaves ovate or oblanceolate, toothed, smooth, but occasionally sparsely strigose on the upper surface, 2–4.5 cm. long; the lower short-petioled; the upper sessile: flowers solitary in the axils of the entire upper leaves: corolla bluish, about 1 cm. long; the lower lip protruding beyond the upper: nutlets winged, yellowish or buff, with muriculate papillae.—Fl. ii. 412 (1814). *S. gracilis* Nutt. Gen. ii. 37 (1818).—Pennsylvania to Virginia, westward and southward to Missouri and Alabama. The following specimens are representative. Pennsylvania: *E. B. Bartram*, Homewood near Pillsbury, June 15, 1907 (P); *S. Brown*, Quakertown, June 3, 1894 (P); *A. A. Heller*, Lancaster, May 28, 1889. New Jersey: *J. Torrey*. Delaware: *W. M. Canby*, June 12, 1897 (P). Maryland: *E. B. Bartram*, Conowingo, May 30, 1907 (P). Virginia: *C. S. Williamson*, Great Falls of Potomac, May 28, 1909 (P). West Virginia: *W. M. Pollock*, May 30, 1896. Kentucky: *S. F. Price*, Bowling Green, May 12, 1900 (M); *E. J. Palmer*, no. 17803 (M). Tennessee: *E. J. Palmer*, no. 17601 (M); *A. Ruth*, Knox Co., May, 1893 (M). Alabama: *H. Eggert*, Etowah Co., June 30, 1897 (M). Missouri: *B. F. Bush*, Dunklin Co., May 22, 1892 (M); *H. Eggert*, St. Louis Co., June 5, 1877 (M); *S. B. Mead*, May 30, 1848 (M); *E. J. Palmer*, no. 15585; *E. Hall*, no. 11397 (M). Indiana: *A. H. Young*, Hanover, August, 1881 (P). Ohio: *W. S. Sullivant*, 1840 (P); *E. L. Moseley*, Florence, August 7, 1897.

Forma **ternata**, n. f., foliis ternatis.—One sheet collected by *C. W. Short* at Lexington, Kentucky, 1835 (P).

8. S. angustifolia Pursh. Fig. 3. Erect, stems many from the base, or branched above, or frequently solitary, 1–2 dm. high, minutely pubescent or almost glabrous, from a moniliform tuberiferous or somewhat fibrous base, purplish below: leaves linear to oblong-ovate, obtuse, practically sessile, commonly conduplicate, entire, 1–3 cm. long, except the lower; these when present, petioled, few-toothed, cordate, small, commonly purplish below: flowers in the upper axils, on pedicels 5–8 mm. long: corolla curved at the slender base, commonly 2–2.5 cm. long but reaching 3 cm., not broadening until 5–10 mm. above the calyx: lips subequal or the lower slightly longer, various as to color, deep blue to purple: nutlets large, with slender papillae and faintly banded at the base.—Fl. ii. 412 (1814). Including *S. Austineae* Eastw., Bull. Torr. Bot. Club, xxx. 493 (1903) and *S. linearifolia* Eastw., l. c. 493 (1903).—Stream-bars or on rocky hillsides from British Columbia and Idaho to southern California. The following are representative. Idaho: *W. Trelease*, no. 4883

(M); *A. A. & E. G. Heller*, no. 3150 (P); *J. H. Sandberg*, no. 8689 (M); *J. B. Leiberg*, no. 1548; *J. F. Macbride*, no. 104. British Columbia: *J. M. Macoun*, no. 67887. Washington: *F. O. Kreager*, no. 10; *C. V. Piper*, nos. 1570, 1571; *A. D. E. Elmer*, no. 900; *R. M. Horner*, no. R178B411. Oregon: *E. W. Hammond*, no. 330 (M); *W. C. Cusick*, nos. 75, 2145; *M. Spalding*, April 28; *E. P. Sheldon*, no. 8007. California: *Culbertson*, no. 4446; *C. C. Parry & J. G. Lemmon*, no. 337; *A. Gray*, Chico (field), February to May, 1885; *C. A. Purpus*, no. 5605 (M); *S. B. Parish*, no. 3122 (M); *L. Abrams*, no. 2778; *H. M. Hall & H. P. Chandler*, no. 242; *A. A. Heller*, no. 7889; *A. Eastwood*, no. 1015.

Var. **canescens** Gray. In many respects similar to the above, mostly simple, virgulate, canescent; leaves linear-oblanceolate, 2–4.5 cm. long, nearly tomentose, firm, not conduplicate, ascending sharply; corolla slender and gracefully curved.—Bot. Calif. i. 603 (1876). *S. siphocampyloides* Vatke, Bot. Zeit. xxx. 717 (1872).—In California from Sierra County southward on foot-hills and mountains. The following are representative. *H. N. Bolander*, nos. 4946 (M), 3947; *W. R. Dudley*, no. 4131; *A. D. E. Elmer*, no. 4434 (M); *W. H. Brewer*, no. 1285.

9. S. antirrhinoides Benth. Fig. 4. Mostly erect, somewhat spindling, simple or branched, from a chiefly fibrous base, 1–3.5 dm. high, minutely pubescent: leaves ovate-oblong, obtuse, mostly short-petioled, never over 2.5 cm. long; all but the very lowest entire: flowers in the upper axils, on pedicels 5–10 mm. long, commonly 1–1.5 cm., never over 2 cm. long; the corolla-tube flaring from immediately above the calyx; the lower lip usually longer, deep blue to violet in color: nutlets with slender papillae, frequently strikingly winged, suggesting those of *S. parvula* and *S. nervosa*.—Bot. Reg. viii. 1493 (1822). *S. sanhedrensis* Heller, Muhlenbergia, i. 31, (1904). *S. nevadensis* Eastwood, Bull. Torr. Bot. Club, xxx. 492 (1903).—Rocky banks and slopes, Idaho and Utah to California and Oregon. The following are characteristic. Idaho: *J. F. Macbride*, nos. 937 (M), 482 (M); *A. Nelson & J. F. Macbride*, no. 1208. Utah: *L. H. Pammel & R. E. Blackwood*, no. 3778. Nevada: *A. A. Heller*, no. 11120; *M. E. Jones*, no. 4036: *A. Nelson & J. F. Macbride*, no. 1927. California: *A. A. Heller & P. B. Kennedy*, nos. 8798, 8843 (M); *J. P. Tracy*, no. 3399; *L. E. Smith*, no. 316; *A. A. Heller*, nos. 5894, 12111. Oregon: *E. Hall*, no. 398; *J. C. Nelson*, no. 2668; *T. Howell*, no. 1253 (M).

10. S. Brittonii Porter. Erect, simple or branched, minutely pubescent or puberulent, usually 1–2 dm. high: underground stems frequently with moniliform tubers: leaves obovate, acuminate at each end or obtuse at tip, somewhat viscid, sometimes purplish beneath, 1.5–3 cm. long, hardly petioled; margins subrevolute; nerves prominent dorsally: corolla slender at base, gradually dilated to ampliate throat and lips, blue, 2–3 cm. long: nutlets dull black, mostly angled with tuberculate processes.—Bull. Torr. Bot. Club, xxi.

177 (1894). *S. resinosa* of Gray, not Torrey.—On foot-hills or plains in northern Colorado and southern Wyoming. The following specimens are representative. Colorado: *G. E. Osterhout*, no. 2587 (P); *H. N. Patterson*, no. 296; *C. C. Parry*, no. 85 (P); *T. S. Brandegee*, no. B 413 (P); *E. B. Payson*, Eldora, July 7, 1919. Wyoming: *A. Nelson*, nos. 94 and 7009.

11. S. nana Gray. Fig. 5. Small, usually 4–6 cm. high, cinereous-puberulent, several branches from the base: rootstocks yellow, with moniliform tubers or simply tuberiferous: leaves entire, ovate to obovate, with long attenuate base, or sometimes spatulate, 1–2 cm. long; nerves usually conspicuous on the lower surface of the leaf: corolla white, the lips equal: nutlets dull yellow with conical protuberances, sometimes angled or compressed.—Proc. Am. Acad. xi. 100 (1876). *S. Footeana* A. I. Mulford, Bot. Gaz. xix. 118 (1894).—Dry sandy hillsides in northwestern Nevada, northern California, southern Oregon, and southwestern Nevada. The following are representative. California: *L. E. Smith*, no. 390; *A. A. Heller*, no. 8086; *H. E. Brown*, no. 613; *E. Palmer*, no. 2602 (P). Nevada: *J. G. Lemmon*, no. 538; *M. E. Jones*, Wadsworth, June 16, 1897 (M); *P. B. Kennedy*, no. 1028 (M). Oregon: *M. E. Peck*, no. 6747; *J. B. Leiberg*, no. 472; *W. C. Cusick*, no. 1980. Idaho: *A. I. Mulford*, Black Cañon, June 18, 1802.

12. S. resinosa Torr. Fig. 8. Stems erect, few to many, from a woody base, 1–3 dm. high, puberulent: leaves ovate, entire, or the lower subcrenulate, attenuate at the base, slightly petioled or sessile, minutely pubescent, resiniferous, 1–2 cm. long; nerves prominent on the upper surface of the leaves: corolla bluish to violet, 12–20 mm. long; upper lip forming an arch with the tube; lower lip occasionally lightly blotched, equal to or exceeding the upper: nutlets about 1 mm. in diameter, black, minutely granular.—Ann. Lyc. N. Y. ii. 232 (1826). *S. Wrightii* Gray, Proc. Am. Acad. viii. 370 (1872).—Kansas to Texas and westward to Arizona, on dry grassy slopes or prairies. The following sheets are representative. Kansas: *J. M. Bates*, no. 4552; *C. L. Shear*, no. 72; *A. S. Hitchcock*, no. 410; *E. Bartholomew*, June 6, 1889 (M). Oklahoma: *R. L. Clifton*, no. 3025; *G. W. Stevens*, no. 1291; *P. J. White*, no. 28 (M); *W. H. Emig*, no. 776 (M). Texas: *E. Hall*, no. 457; *E. Palmer*, no. 1086-7; *A. A. Heller*, no. 1606; *F. Lindheimer*, no. 674; *E. J. Palmer*, nos. 14117 (M) 11563 (M), 13738 (M), 10229 (M). New Mexico: *G. Thurber*, no. 286; *C. Wright*, no. 1540; *O. B. Metcalfe*, no. 934; *A. Gordon*, no. 67 (M). Arizona: *L. N. Goodding*, nos. 848, 224 (M); *J. G. Lemmon*, no. 2860; *D. Griffiths*, no. 4809; *C. G. Pringle*, no. 15956.

Var. **brevifolia** (Gray), n. comb. Stems from a ligneous base, mostly over 2 dm. high, cinereous-puberulent: leaves narrowly oblong, entire: corolla 20–25 mm. long, flaring at the top.—*S. integrifolia*, var. *brevifolia* Gray in E. Hall, Pl. Tex. no. 458 (1873), name only. *S. brevifolia* Gray, Syn. Fl. ii. 380 (1878).—Northeastern Texas, on dry calcareous hills or rocky bluffs. The following specimens

represent the range and habit of the variety. *E. Hall*, no. 458 (P); *J. Reverchon*, nos. 440, 2059, 771 (M) and 2126 (M); *G. W. Letterman*, Texarkana, October 15–24, 1894, and Dallas, August, 1882.

This form was first given recognition by Dr. Gray as a variety of *S. integrifolia*, but was later raised to specific rank. It is, however, merely a variety of *S. resinosa*. An inspection of the range of *S. integrifolia* shows that it has no representative in Texas except var. *hispida*. Finally, the nutlet of *S. brevifolia* is an exact duplicate of that of *S. resinosa*. Although with leaves somewhat longer than those of the ordinary *S. resinosa* (about 1 cm.) a quirk in the nomenclatorial rules gives to this plant the somewhat paradoxical name of *S. resinosa*, var. *brevifolia*. Originally connected with *S. integrifolia*, the application of the name was apparent.

13. S. Drummondii Benth. Fig. 11. Stems many, erect, branching at the base, villous-pubescent, mostly 1–2.5 dm. high: leaves slightly petioled or subsessile, oblong-ovate or oval, entire, 1–2 cm. long, or commonly less, undulate-crenate: calyx villous, frequently tinged with purple: corolla short, 8–12 mm. long, bluish purple or violet; the lower lip exceeding the upper, flaring, notched, violet-spotted: nutlets yellowish to dark brown, or blackish with age, with conical or frequently laminate processes.—Lab. Gen. et Sp. 441 (1832–1836). —*S. Helleri* Small, Fl. So. U. S. 1024 (1903).—Mostly on rich plains or in open woods throughout Texas, in adjacent Oklahoma and New Mexico, and running into Mexico. The following sheets are representative. New Mexico: *C. Wright*, nos. 1539 and 1540. Oklahoma: *G. W. Stevens*, nos. 695 and 1078. Texas: *S. M. Tracy*, no. 7994; *G. Thurber*, San Antonio, April, 1853; *F. Lindheimer*, nos. 1095 and 143; *E. Hall*, no. 456; *B. F. Bush*, no. 627; *E. J. Palmer*, nos. 9685 (M) and 13482 (M); *G. Jermy*, no. 101 (M); *W. M. Canby*, no. 201 (M); *J. Reverchon*, no. 2065 (P); *H. A. Pilsbry*, New Braunfels, April 17–19, 1903 (P); *A. A. Heller*, no. 1503 (P); *H. C. Hansen*, no. 542 (M).

Somewhat variable in the size of respective parts, this species is yet constant enough not to warrant any breaking up into subdivisions. The shape of the corolla is especially constant. The nutlets serve to indicate a connection with the *S. nervosa–S. parvula* group.

14. S. cardiophylla Engelm. & Gray. Stems slender, upright, branching, 3–6 dm. tall, puberulent, often purplish-tinted on the lower part: leaves petioled, deltoid or subcordate, mostly obtuse, crenate, 1.5–4 cm. long: inflorescence loose, leafy-bracted: corolla slender, 12–17 mm. long, blue: crest of calyx commonly purple: nutlets black, tuberculate with truncate processes, never merely granular as in *S. resinosa*.—Pl. Lindh. i. 19 (1845).—Arkansas and Texas, on gravelly hillsides or sandy woods. The following sheets

are representative. Arkansas: *F. L. Harvey*, no. 114; *E. J. Palmer*, no. 10503 (M); *G. W. Letterman*, Hot Springs, August 4, 1879 (M), and July or August, 188- (M). Texas: *J. Reverchon*, no. 3910; *R. A. Dixon*, no. 339; *F. Lindheimer*, no. 144; *E. Hall*, no. 454; *E. J. Palmer*, no. 7887 (M); *H. Eggert*, Palestine, June 10, 1899.

A distinct species with achenes that show closer relation to *S. pilosa* than to any other *Scutellaria*. The leaves also suggest a relation. It is interesting to note that toward the west *S. pilosa* runs out in Arkansas, though no intermediate forms between these two are found.

15. S. pilosa Michx. Stem erect, mostly slender and simple, the inflorescence sometimes branched, finely pubescent or hirsute, 2–7 dm. high; internodes frequently 10 cm. long: leaves petioled, crenate; the lower ovate or oblong-ovate, obtuse, abrupt or even truncate at the base, 2–8 cm. long; the upper subsessile and somewhat oblong-spathulate: corolla slender, bluish, 1–1.5 cm. long; lips subequal; the upper arched: calyx villous: nutlets with protuberances as in *S. serrata* (fig. 13) but smaller (1–1.5 mm. in diam.).—Fl. Bor.-Am. ii. 11 (1803). ? *S. caroliniana* Walt. Fl. Car. 163 (1788). Including var. *β* Benth. (*S. oralifolia* Pers. Syn. ii. 136 (1807)) and *S. altamaha* Small, Fl. So. U. S., 1022 (1903).—River-banks or woodlands, New York to Michigan and southward to Georgia and Texas. The following are characteristic: New York: *J. Schenk*, Long Island, June 28, 1878 (M). Pennsylvania: *T. C. Porter*, Easton, July 10, 1868 (P); *B. Long*, Lancaster, June 22, 1909 (P). New Jersey: *C. W. Short*, Princeton, July 11, 1850 (P); *B. Long*, no. 5641 (P). District of Columbia: Washington, *E. S. Steele*, June 15, 1896. Virginia: *A. H. Curtiss*, Bedford County, June 15, 1871; *H. D. House*, no. 1046. West Virginia: *J. M. Greenman*, no. 478 (M). North Carolina: *J. R. Churchill*, Hot Springs, June 1, 1899; *A. A. Heller*, Hickory, June 23, 1893 (P). South Carolina: *W. Stone*, no. 546 (P); *Rev. J. Backman*, Charleston. Georgia: *A. H. Curtiss*, no. 6826 (M); *R. M. Harper*, no. 1358. Alabama: *C. Mohr*, Mobile, May, 1884 (M); *F. S. Earle & C. F. Baker*, Auburn, June 5, 1897 (M). Mississippi: *J. Skehan*, no. 77; *S. M. Tracy*, no. 4451. Louisiana: *J. Hale*, Alexandria (P); *C. R. Ball*, no. 656 (M). Texas: *C. Wright*. Oklahoma: *G. W. Stevens*, no. 2732. Arkansas: *N. M. Glatfelter*, Eureka Springs, July 17, 1898 (M). Missouri: *E. J. Palmer*, no. 5802 (M); *B. F. Bush*, no. 667 (M). Tennessee: *H. Eggert*, Sherwood, June 6, 1897 (M); *T. H. Kearney*, no. 871 (M). Kentucky: *C. W. Short*, Lexington (P). Indiana: *C. C. Deam*, no. 20417. Michigan: (M) no. 109374. Illinois: *E. J. Palmer*, no. 15399.

Var. hirsuta (Short) Gray. Like the preceding but taller and with leaves having coarser crenations, and longer pubescence.—Syn. Fl. ii. 379 (1878). *S. hirsuta* Short, Cat. Pl. Ken. 8 (1835).—Not a very marked variety; found only in northern Kentucky. We have examined the following sheets, all collected by *C. W. Short:* Louis-

ville, September, 1835 (P), 2 sheets; 1842, 2 sheets; 1842, no. 109393 (M); 1846, no. 109395 (M); 1848, nos. 109394 (M), 109396 (M), and 109397 (M).

16. S. INTEGRIFOLIA L. FIG. 10. Erect, simple or branched at the top, 2–7 dm. tall, covered with fine puberulence: the upper leaves linear-oblong, gradually narrowed (when present) to the short petiole, 1.5–6 cm. long; the lower strongly petioled, ovate or cordate, obtuse, crenate, sometimes deciduous, leaving the stem with only entire leaves; corolla 18–24 mm. long, bluish or purple; the lower lip very ampliate; the upper broad and arching: nutlets with flattish papillae giving it a rosulate appearance.—Sp. Pl. ii. 599 (1753). *S. hyssopifolia* L. Sp. Pl. ii. 599 (1753). *S. polymorpha* Hamilt. Monog. 38 (1832).—Low moist ground from Massachusetts south to Florida and Mississippi. The following are representative. PENNSYLVANIA: *E. B. Bartram*, no. 1078; *F. W. Pennell*, no. 69 (P); *H. W. Pretz*, no. 7559 (P). NEW JERSEY: *B. Long & S. Brown*, no. 17 (P); *W. Stone*, Medford, July 4, 1910 (P). DELAWARE: *E. Tatnall*, Wilmington, 1886, Porter, June 6, 1874. MARYLAND: *W. R. Maxon*, no. 5918. VIRGINIA: *A. A. Heller*, no. 930; *B. L. Robinson*, Buckroe, May 21, 1912. NORTH CAROLINA: *T. G. Harbison*, Waynesville, July 1, 1897; *Biltmore Herbarium*, no. 954. SOUTH CAROLINA: *J. Perkins*, Summerville, April 29–May 10, 1918; *J. Davis*, no. 8381 (M). GEORGIA: *H. Eggert*, Belair, May 22, 1899 (M). FLORIDA: *S. M. Tracy*, no. 9162; *A. A. Eaton*, no. 1410. ALABAMA: *A. Ruth*, no. 540 (M); *C. Mohr*, Mobile, May, 1891 (M). KENTUCKY: *C. W. Short*, Flats of Red River (P). TENNESSEE: *A. Ruth*, no. 120; *H. Eggert*, Tullahoma, June 9, 1897 (M). MISSISSIPPI: *J. Skehan*, no. 63.

Var. MAJOR Chapm. More rigid in habit, rather heavily pubescent, 2–8 dm. high; with several pairs of dentate, petioled basal leaves, these larger than the bracts.—Fl. So. U. S. 323 (1860). Incl. *S. arenicola* Small, Bull. Torr. Bot. Club, xxv. 143 (1898).—Low sandy locations, Georgia and Florida to Mississippi. The following specimens are characteristic. FLORIDA: *A. H. Curtiss*, nos. 2060 and 2058; *G. V. Nash*, no. 1316; *A. A. Eaton*, no. 1153; *H. J. Weber*, no. 514 (M). MISSISSIPPI: *S. M. Tracy*, no. 4453 (M); *J. Skehan*, Ocean Springs, May 8, 1895 (M) and no. 62. GEORGIA: *Mrs. Say* (?), Savannah (P).

Var. HISPIDA Benth. A slender form, reddish in color when dried, stem and leaves distinctly pilose: the leaves thin: the crenate basal ones, when present, not exceeding the upper cauline leaves.—Lab. 435 (1832–1836).—Florida to Arkansas and Texas on moist sandy ground. The following are characteristic. FLORIDA: *A. H. Curtiss*, no. 6645 (M); *S. M. Tracy*, no. 9162 (M), (M) no. 109080. GEORGIA: *H. Eggert*, DeKalb Co., July 24, 1897; (M) no. 788487. LOUISIANA: *J. Hale*, Alexandria (P); *E. J. Palmer*, no. 7604 (M); *C. R. Ball*, no. 517; *J. F. Joor*, Madisonville, May 4, 1888 (M); *T. Drummond*, no. 248. TEXAS: *J. Reverchon*, no. 2127 (M); *E. Hall*, no. 455. ARKANSAS: *E. J. Palmer*, no. 10522 (M), *H. Eggert*, Jefferson Co., June 8, 1898 (M).

Var. MULTIGLANDULOSA Kearney. A short-stemmed leafy form, never exceeding 2.5 dm.; puberulent or pilose on the leaf-nerves and margins and on the stem: leaves oblong-ovate or spatulate, slightly, if at all petioled, entire, revolute-margined; occasionally 1–3 pairs of small, dentate petioled basal leaves, but these always shorter than the upper: flowers in the upper axils, the inflorescence appearing scarcely racemose: corolla as in the species.—Bull. Torr. Bot. Club, xxi. 482 (1894).—Pine barrens or dry open ground, Georgia and Florida to Louisiana. The following are characteristic. FLORIDA: *A. S. Hitchcock*, Suwanee Co., June–July, 1898 (M), and no. 477 (M); *C. S. Williamson*, Palatka, April, 1897 (P); *Dr. Leavenworth*, Fort King (P). GEORGIA: *R. M. Harper*, no. 822. ALABAMA: *Gates & Jewett*, Mobile. LOUISIANA: *E. J. Palmer*, no. 7959 (M).

Var. **glabriuscula** (Fernald), n. comb. Much like the variety *hispida*: slender, 2–5 dm. high, simple or branched, very slightly pubescent or glabrous: inflorescence racemose: leaves on distinct petioles, practically glabrous; the lower sometimes dentate: corolla subglabrous.—*S. glabriuscula* Fernald, Bot. Gaz. xxxiii. 156 (1902). "*S. hyssopifolia* L." on many herbarium sheets, *nomen dubium*.—Mostly on sandy pine lands, Georgia and Florida to Mississippi. The following serve to represent the variety. GEORGIA: *R. M. Harper*, no. 885. FLORIDA: *A. H. Curtiss*, nos. 6097, 3, and 13425 (M); *G. V. Nash*, no. 2277. ALABAMA: *H. Eggert*, Cullman, June 18, 1897 (M); *F. S. Earle & C. F. Baker*, Evergreen, June 6, 1897 (M). MISSISSIPPI: *J. Skehan*, no. 22603; *S. M. Tracy*, no. 4900.

Var. **floridana** (Chapm.), n. comb. A very slender linear-leaved form, minutely pubescent: lips of the corolla very broad.—*S. floridana* Chapm. Fl. So. U. S. 324 (1860).—Probably confined to the pine barren swamps near Apalachicola in western coastal Florida. The following are representative. (M) nos. 788588 (Apalachicola), 108997 (*D. U. Dean*), 108999, 109000 (Herb. Chapm.); *A. W. Chapman*, no. 13207 (M), and Apalachicola (ex. Herb. J. Carey).

17. S. BUSHII Britton. FIG. 15. Erect, mostly caespitose in habit; stems simple, whitish-pubescent or puberulent, 1.5–3.5 dm. high: leaves entire, oblanceolate, obtuse, sessile: nutlets with more wart-like, less rosulate papillae: otherwise as in *S. integrifolia* var. *multiglandulosa* to which it is nearest related.—Man. 785 (1901).—Rocky barrens or hillsides in Carter and Shannon Counties, MISSOURI. The following are representative: *B. F. Bush*, nos. 49 (M), 189, 378, 7817 (M), 461 (M), 48 (M), 4737 (M); *E. J. Palmer*, no. 19496.

18. S. CANESCENS Nutt. FIG. 14. Erect, tall, much branched at the top, canescent throughout except the upper surface of the leaves, 3–12 dm. high: leaves ovate-lanceolate, acute to cordate at the base, crenate, usually glabrous above, 5–12 cm. long, on petioles 1.5–4 cm. long: inflorescence mostly panicled: corolla 18–25 mm. long; upper lip very much arched over the shorter lower one: nutlets with truncate papillae, brownish, close to those of *S. serrata* but smaller and with blunter papillae.—Gen. ii. 38 (1818). *S. incana* Muhl. Cat.

56 (1813), *nomen submudum*.—Dry woods, river-banks, etc., Pennsylvania to Wisconsin and south to Arkansas and Georgia. The following represent the plant and its range. PENNSYLVANIA: *O. E. Jennings*, Glenshaw, August 3, 1918; *T. C. Porter*, Huntingdon Co. INDIANA: *C. C. Deam*, no. 5183. ILLINOIS: *H. A. Gleason*, no. 2617. WISCONSIN: *T. J. Hale*, Lake Pepin, 1861. KANSAS: *A. S. Hitchcock*, no. 797. MISSOURI: *B. F. Bush*, no. 6113; *E. E. Sherff*, no. 635. ARKANSAS: *F. L. Harvey*, no. 109. TENNESSEE: *S. M. Bain*, no. 323. KENTUCKY: *C. W. Short*, 1840 (M). WEST VIRGINIA: *W. M. Pollock*, Upshur Co., July 8, 1895 (M). NORTH CAROLINA: *T. G. Harbison*, Waynesville, May 30, 1897. GEORGIA: *R. M. Harper*, no. 1368.

Var. PUNCTATA Chapm. Like above but with foliage glabrate and densely punctate.—Fl. So. U. S. 323 (1860).—North Carolina, Georgia and Florida. The following are characteristic. NORTH CAROLINA: *J. D. Smith*, August 7, 1882, *C. S. Williamson*, Balsam, July, 1897. GEORGIA: *J. K. Small*, Rabun Co., August 11, 1893; *C. S. Williamson*, Atlanta, August, 1896. FLORIDA: *G. V. Nash*, Bellair, September 3, 1895, (M) nos. 108778 and 108875.

19. S. SERRATA Andr. FIG. 13. Stem erect, 2.5–6 dm. high, nearly always simple, with from 3–5 pairs of leaves: leaves thin, mostly glabrous, ovate, acuminate at both ends or rounded at the base, serrate or crenate, 2.5–10 cm. long, on slender petioles 2.5 cm. or less long; the lower pairs smaller; the floral leaves abruptly reduced and becoming entire: inflorescence with rare exceptions a simple terminal raceme: corolla violet-blue, 2–3 cm. long; the lower lip nearly equalling the upper, sometimes appearing longer by protrusion at right angles from the tube: nutlets dark brown, about 2 mm. in diameter, with obtusely pointed papillae.—Bot. Rep. t. 494 (1808). *S. lacrigata* Aiken in Eaton, Man. ed. 6: 333 (1833).— Woods and damp habitats, Pennsylvania to Missouri and North Carolina. The following represent the plant and its range. PENNSYLVANIA: *G. W. Smith*, Delaware Co., June 23,— (P); *J. Pennell*, no. 2713 (P); *E. B. Bartram*, Darby Creek, July 21, 1907 (P); *U. C. Smith*, no. 1177 (P). MARYLAND: *J. D. Smith*, Patapsco Valley, Howard Co., May 25, 1881; *J. J. Carter*, Conowingo, June 1, 1906. DISTRICT OF COLUMBIA: *E. S. Steele*, Washington, May 19, 1896; *T. Morong*, May 21, 1877 (M). WEST VIRGINIA: *F. W. Hunnewell*, July 4–6, 1914. VIRGINIA: *S. B. Buckley*, June, 1838 (M); *A. H. Curtiss*, Bedford Co., June 6, 1872 (M); *H. D. House*, no. 858 (M). NORTH CAROLINA: *W. W. Ashe*, no. 6445; *Biltmore Herbarium*, Biltmore, no. 1250b. TENNESSEE: *A. Ruth*, no. 116. ILLINOIS: ex. Herb. *G. Thurber*. MISSOURI: Pilot Knob, June 17, 188-.

Var. **montana** (Chapm.), n. comb. Similar to above, but stems and leaves glandular-pubescent; occasionally the upper leaves nearly hastate or very simply serrate: corolla bluish, strongly ampliate upward, 3 cm. or slightly more in length.—*S. montana* Chapm., Bot. Gaz. iii. 11 (1878). Inc. *S. Mellichampii* Small, Fl. 1022 (1903).—

In the mountains of northern Georgia, western North Carolina, South Carolina, southern Tennessee, and northern Alabama. The following are representative. South Carolina: *Mellichamp*, no. 14 (M), and Bluffton, 1872 (M). Georgia: *A. W. Chapman*, Rome (M); (M) nos. 109124, 109125, 788591 and 109485. North Carolina: *T. G. Harbison*, Highlands, July 20, 1904. Tennessee: *J. R. Churchill*, Chattanooga, May 21, 1911; *J. F. James*, Spring City, June 11, 1883. Alabama: *H. Eggert*, Springville, July 7, 1898; *S. Watson*, Queensboro, 1857.

20. S. VERSICOLOR Nutt. Fig. 9. Erect, glandular-hairy, especially in the inflorescence, which is commonly branched, 2–8 dm. high: leaves broad, cordate, rugose, crenate, 3–12 cm. long, long-petioled: corolla 1.7–2.5 cm. long, slender up to the throat, ampliate at the lips, blue to purple at the limb, but whitish on the tube: nutlets buff to orange in color, the processes tuberculate-conical.—Gen. ii. 38 (1818). ? *S. cordifolia* Muhl., Cat. 56 (1813), *nomen subnudum*. *S. cordifolia* var. *pilosissima* Mack. & Bush, Trans. Acad. Sci. St. Louis, xii. 84 (1902), in part.—Wisconsin and Iowa to Louisiana and eastward to North Carolina. The following are representative. Wisconsin: *T. J. Hale*, Maiden Rock, 1861 (M); *Lapham* (P). Iowa: *A. S. Hitchcock*, Iowa City, 1888; *C. R. Ball*, no. 1588 (M). Illinois: *F. C. Gates*, no. 10828 (M); *O. E. Lansing*, no. 62; *H. C. Skeels*, no. 388; *E. E. Sherff*, no. 320; *H. A. Gleason*, no. 1842. Missouri: *B. F. Bush*, nos. 5851, 725 (M). Arkansas: no. 5912 (M). Louisiana: *Dr. Carpenter*, Jackson, June; *E. J. Palmer*, no. 7601. Mississippi: *S. M. Tracy*, no. 4896. Kentucky: *S. F. Price*, Bowling Green. Tennessee: *E. J. Palmer*, no. 17640 (M). Ohio: *E. L. Moseley*, Margaretta, June 6, 1895. Virginia: *A. H. Curtiss*, Peaks of Otter, August 6, 1871. Maryland: *W. E. A. Aikin*, Harper's Ferry. North Carolina: *R. Thaxter*, Cullowhee, June 15–July 15, 1887; *C. S. Williamson*, Weldon, August, 1892 (P). Grades gradually into

Var. BRACTEATA Benth. This form as found in Texas is very distinct, with floral bracts showy and much exceeding the combined length of pedicel and calyx. The leaves of the stem gradually merge into the bracts.—Lab. Gen. et Sp. 433 (1832–1836). *S. cordifolia* var. *pilosissima* Mack. & Bush, Trans. Acad. Sci. St. Louis, xii. 84 (1902), in part. *Lindheimer's* no. 492, *J. Reverchon's* nos. 769 and 253, and *C. Wright's* no. 476 are typical. It is probable also that certain plants from Arkansas and Missouri should be referred here, but one hardly knows where to stop.

Var. MINOR Chapm. Very similar to typical *S. versicolor*, having its diminutive size but with much smaller ovate, rugose leaves.—Fl. So. U. S. 323 (1860). *S. rugosa* Wood, Cl. Bk. 246 (1848).[1]

In his earliest description Chapman allocates this form to the "dry woods near Washington, Wilkes County, Ga.," and later he merely states "upper districts." The plants which seem most logi-

[1] In later editions of his Class Book, Wood reduces his *S. rugosa* to *S. saxatilis*.

cally to be referred to this category occur rather scatteringly on the southern edge of the range of *S. versicolor*, and some of the specimens are not distantly related to *S. saxatilis*. However, Chapman had a different plant in mind. The following are taken as representatives. Missouri: *W. Trelease*, no. 721 (M); *B. F. Bush*, no. 791 (M); *K. K. Mackenzie*, Eagle Rock, September 23, 1896 (M). Arkansas: *E. J. Palmer*, no. 4750 (M). A plant collected at Harper's Ferry, and answering to the description of *S. rugosa*, collected at the same place, is also included here.

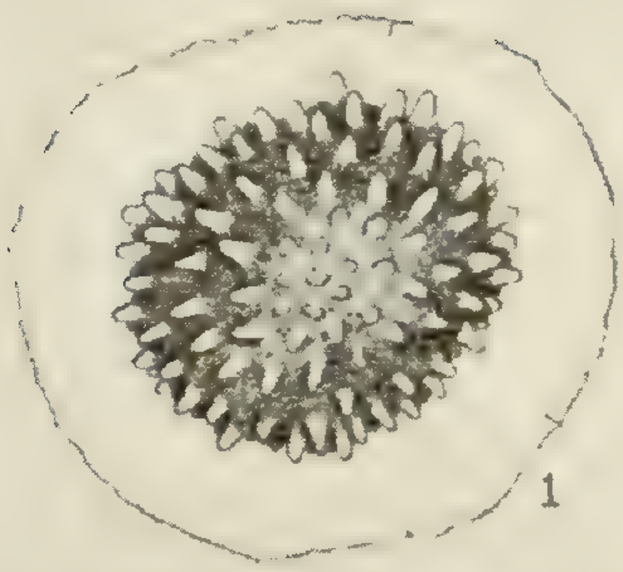
21. S. saxatilis Riddell. Erect, or somewhat assurgent and weak, glabrous or somewhat hairy, 1–5 dm. long: leaves thin, with few spreading hairs on the upper surface, obovate or cordate, obtuse, long-petioled; the upper crenate-serrate; bracts entire: corolla about 2 cm. long, slender; the upper lip not arched, nearly as in *S. versicolor*: nutlets resembling those of *S. versicolor*, but the protuberances somewhat longer and more acute.—Supp. Cat. Ohio Pl. 14 (1836).—Rocky woodlands from Pennsylvania to Kentucky and Tennessee. Pennsylvania: *J. A. Schaer*, Jacobs Creek, Westmoreland County, July 20, 1900 (P); *C. S. Williamson*, Ohio Pyle, August 31, 1905. New Jersey: *C. F. Parker*, no. 6619 (M). Delaware: *E. Tatnall*, Wilmington, September 8, 1858. District of Columbia: *W. R. Maxon*, no. 6242. Ohio: *H. N. Mertz*, Steubenville, June 5, 1880 (P). West Virginia: *Mr. & Mrs. E. S. Steele*, no. 31 (M). Kentucky: *C. W. Short*, no. 2 (P). Tennessee: *A. Ruth*, no. 545 (M); *A. H. Curtiss*, no. 2054.

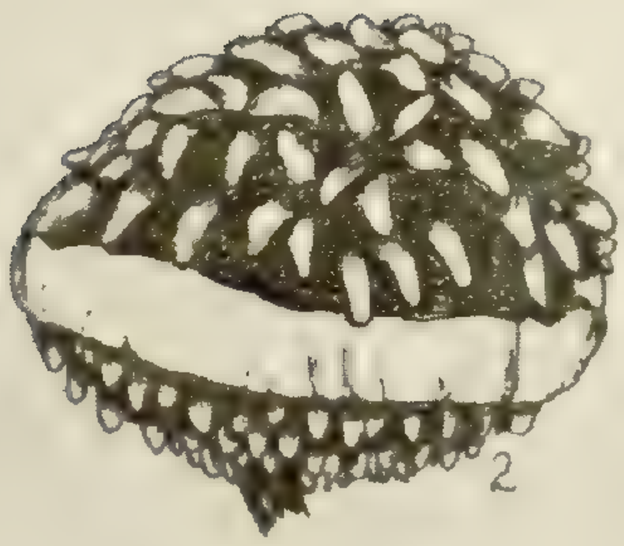
Var. **arguta** (Buckley), n. comb. This is doubtfully given rank as a variety of the above. It is small, assurgent, with ovate, sharply dentate leaves scatteringly pilose, and is confined to the mountains of North Carolina and Tennessee.—*S. arguta* Buckley, Am. Journ. Sci. xlv. 170, 177 (1843).—The following represent the plant. North Carolina: *Biltmore Herbarium* (G), no. 7171; Tennessee: *A. Ruth*, no. 119, 8.

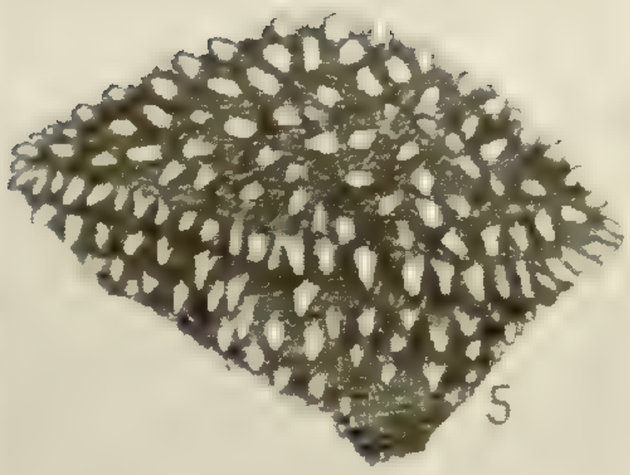
Colorado College,
Colorado Springs, Colorado.

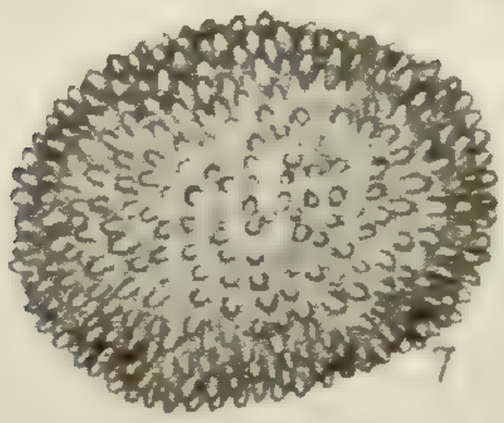
EXPLANATION OF PLATES 140 AND 141.

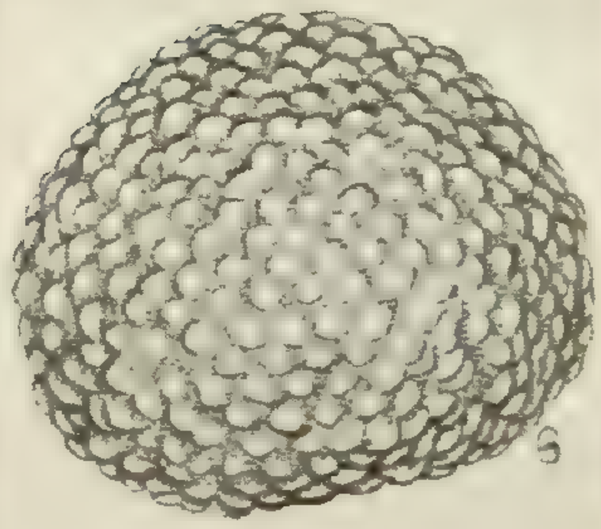
Nutlets of *Scutellaria*, about × 25. Fig. 1, *S. nervosa*; fig. 2, *S. parvula*; fig. 3, *S. angustifolia*; fig. 4, *S. antirrhinoides*; fig. 5, *S. nana*; fig. 6, *S. epilobiifolia*; fig. 7, *S. lateriflora*; fig. 8, *S. resinosa*; fig. 9, *S. versicolor*; fig. 10, *S. integrifolia*; fig. 11, *S. Drummondii*; fig. 12, *S. tuberosa*; fig. 13, *S. serrata*; fig. 14, *S. canescens*; fig. 15, *S. Bushii*.





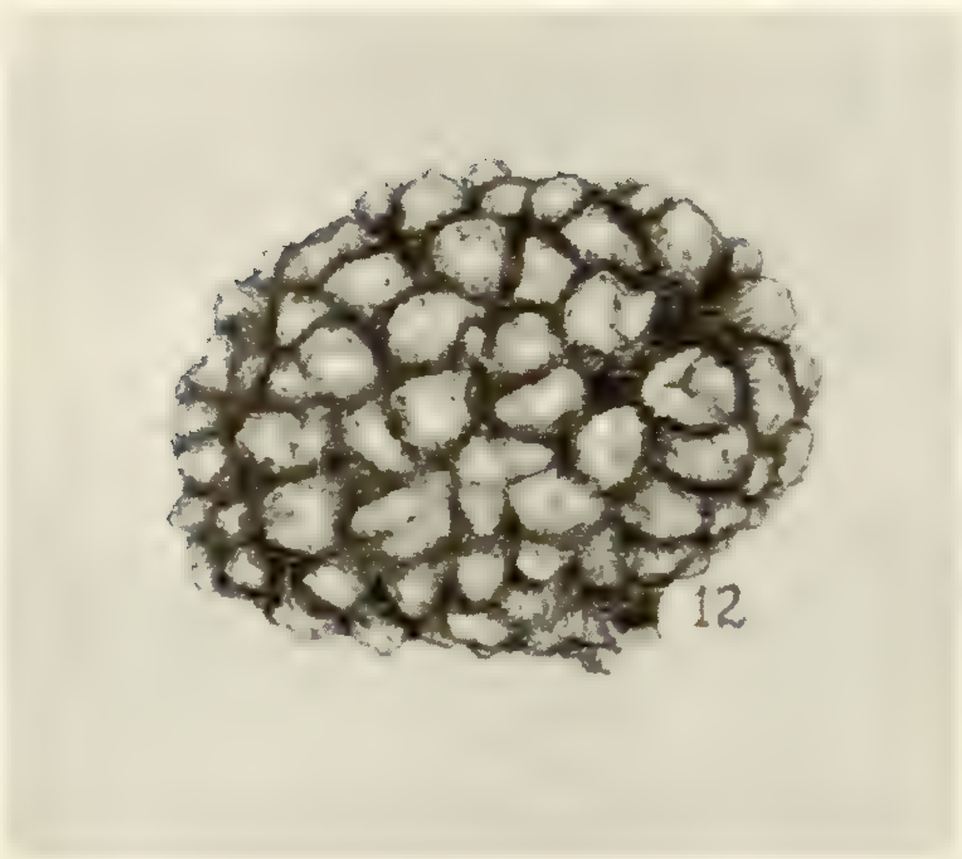






C. W. P. del.

NUTLETS OF SCUTELLARIA.



C. W. P. del.

NUTLETS OF SCUTELLARIA.

Reprinted from RHODORA, Vol. 26, May and June, 1924

CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY

NEW SERIES, No. LXXII

I. Polystichum mohrioides and some other subantarctic or Andean Plants in the northern Hemisphere 89
II. The dwarf Antennarias of northeastern America 95
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IV. Some Senecios of eastern Quebec and Newfoundland. . . 113
V. New or restudied Plants of eastern America 122

By M. L. FERNALD

DATES OF ISSUE

Pages 89 to 107, plates 142 and 143 . . . . . 18 June, 1924
" 113 to 127, plate 144 . . . . . 5 July, 1924

MISSOURI BOTANICAL GARDEN
RECEIVED

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CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY.—New Series.—No. LXXII.

M. L. Fernald.

I. POLYSTICHUM MOHRIOIDES AND SOME OTHER SUBANTARCTIC OR ANDEAN PLANTS IN THE NORTHERN HEMISPHERE.

Polystichum mohrioides (Bory) Presl, var. **scopulinum** (D. C. Eaton), n. comb. *Aspidium aculeatum*, var. *scopulinum* D. C. Eaton, Ferns of N. A. ii. 125, t. lxii. fig. 8 (1880). *P. scopulinum* (D. C. Eaton) Maxon, Fern Bull. viii. 29 (1900). *P. aculeatum scopulinum* (D. C. Eaton) Gilbert, List N. A. Pterid. 20 (1901). *P. Lonchitis*, var. *scopulinum* (D. C. Eaton) Jones, Bull. Univ. Mont., Biol. Ser. xv. 7 (1910).

After several times collecting and studying during a period of nearly twenty years this anomalous plant, which has been treated as a variety of *Polystichum aculeatum* or of *P. Lonchitis*, as *P. mohrioides* and as a distinct species standing midway between *P. aculeatum* and *P. mohrioides*, I find myself firmly convinced that its relationship is primarily with the latter plant and that it is at best a northern variety of that wide-ranging austral species. *P. mohrioides* was discovered on the Falkland Islands (les Malouines) by D'Urville & Lesson during the voyage around the world of the French corvette, La Coquille. It was described by Bory de St.-Vincent as *Aspidium Mohrioides* and beautifully illustrated.[1] Gradually our knowledge of the plant has been extended and *P. mohrioides* in one form or another has been found to have a wide and very distinctive range, one which, with some modifications, is duplicated in several other groups of plants.

[1] Bory in Duperrey, Voyage autour du Monde sur La Coquille, Bot. pt. 1: 267, t. 35, fig. 1 (1829).

West of the Falkland Islands it is found on Tierra del Fuego, whence it follows slightly northward on the high Andes as *P. mohrioides*, var. *plicatum* (Poeppig) Christensen[1] or *P. andinum* Phil., which differs from the Falkland plant only in its dwarf size (growing in exposed alpine habitats) and in the paler and thinner scales of the stipe. Skottsberg got a form of *P. mohrioides* on South Georgia, 800 miles (1290 km.) southeast of the Falklands; Moseley, during the voyage of the Challenger, collected an extreme form on Marion Island, 1200 miles (1930 km.) southeast of the Cape of Good Hope and more than 3000 miles (4800 km.) northeast of South Georgia; and the next year De l'Isle discovered the species on Amsterdam Island, more than 2000 miles (3200 km.) east of Marion Island. Northward, in the Andes, it occurs as *P. mohrioides*, var. *elegans* (Remy) Christensen[2] or *P. elegans* Remy, an extreme with longer and more divided pinnae.

In North America two members of this alliance are recognized: *P. Lemmoni* Underwood and *P. scopulinum* (D. C. Eaton) Maxon, both confined to arid regions of the Sierra Nevada-Cascade axis, with the exception of four isolated stations for the latter, one each in the Teton Mts. of Idaho, the Mission Mts. of Montana, the Wasatch Mts. of Utah and the Shickshock Mts. of Gaspé Co., Quebec. So close are these North American plants to those of the southern Andes and the Falklands that the late D. C. Eaton, after trying to find specific differences, described and illustrated[3] as typical *P. mohrioides* (or *Aspidium mohrioides*) the Californian *P. Lemmoni* and at the same time, in describing his *Aspidium aculeatum*, var. *scopulinum*, he surmised that it belonged with *P. mohrioides*, saying: "I have some doubt about the plant here named var. *scopulinum*, as it differs more from all the rest than any of them do from each other. It has a little the habit of *A. mohrioides*, but, though the specimens I have seen are old, they still keep in a degree the aculeate points of the present species."[4] And again he wrote that his var. *scopulinum* was "almost as much like *A. mohrioides* as it is like *A. aculeatum*, but as it has the lobes of the pinnae somewhat aculeate it is better to leave it with the latter species."[5] As already stated, Eaton had tried to find specific characters for *P. Lemmoni* but was unable to do

[1] Christensen, Arkiv för Bot. x. No. 2: 17 (1910).
[2] Christensen, l. c. (1910).
[3] Eaton, Ferns of N. A. ii. 251, t. lxxx. figs. 4–9 (1880).
[4] Eaton, l. c. 127, 128.
[5] Eaton, l. c. 254.

so, saying clearly of the Lemmon plant: "At first I believed it to be a distinct species."[1] Similarly the great Swiss specialist upon the ferns, Christ,[2] in monographing *Polystichum* § *Mohrioides* had no hesitation in treating *P. Lemmoni* as identical with *P. mohrioides* (which, as understood by him, was chiefly var. *elegans*).

In his discussion of the ferns of temperate South America collected by Skottsberg, Christensen[3] points out the important characters which separate *P. mohrioides* from *P. aculeatum* and its allies; namely, the fleshy texture, scaleless surfaces of the fronds, thick and flat ribs and the large and immersed stomata (so immersed that under a good lens the lower surfaces of the fronds appear pitted or punctate). The fleshy texture, flat ribs and punctate lower surfaces are all obvious enough in *P. scopulinum*, and the fronds are either with or without some scales on the lower surface, but this latter character is inconstant, some sheets of perfectly good *P. mohrioides*, var. *typicum* Christensen from the Falkland Islands (coll. *Cunningham*, January 21, 1868) before me showing numerous slender scales among the sori. The Cunningham specimens are quite like the original plate of *Aspidium mohrioides* and in outline, size, texture and punctation they are so close to several North American specimens of *P. scopulinum* that only the keenest inspection reveals slight differences. Thus Parish's material from Snow Canyon, San Bernardino Co., California, is a very close match in all these characters for the Cunningham plant and for the original plate. All the Falkland material I have seen, however, has the basal scales of the stipe darker and firmer than in *P. scopulinum*, although the Fuegian specimens (var. *plicatum*) have them as pale and thin.

P. scopulinum is regularly defined as differing from *P. mohrioides* and *P. Lemmoni* in the sharper and more acicular tips of the upper lobes or teeth of the pinnae. In general this character holds, but in the Cunningham material from the type-region of *P. mohrioides* the teeth of the lower pinnae are quite as sharp as in some of the North American plants, while in the Parish material above cited only the lowest pinnae show the sharp teeth, the upper having them quite as blunt as in the most ideal *P. mohrioides* or in *P. Lemmoni*. Furthermore the plant of Marion Island has some of the pinnae quite as spinulose-toothed as in the most extreme *P. scopulinum*.

[1] Eaton, l. c. 128.

[2] Christ, *Ueber die australen Polystichum-Arten*. Arkiv för Bot. iv. No. 12: 1–3 (1905).

[3] Christensen, l. c. 18.

Reference has been made to the fact that neither D. C. Eaton nor Dr. Christ could distinguish *P. Lemmoni* from *P. mohrioides*, var. *elegans*. Well developed fronds of the two are almost identical and *P. Lemmoni* has the scaleless surfaces of theoretical *P. mohrioides*, and the pits in its lower faces are unusually conspicuous. In only one character, apparently, can the two be distinguished with satisfaction: in var. *elegans* the scales at the base of the stipe are castaneous and subcoriaceous as in typical *P. mohrioides;* in *P. Lemmoni* paler and thinner as in vars. *plicatum* and *scopulinum*. In their extremes *P. Lemmoni* and *P. mohrioides*, var. *scopulinum* are well differentiated, but certain small plants of the former too closely simulate plants of the latter with unusually pinnatifid pinnae; and in view of their both possessing the essential characters of *P. mohrioides* and the failure of the spinulose teeth of var. *scopulinum* to retain the constancy one might wish them to, it seems the part of sound classification to treat *P. Lemmoni* as

P. MOHRIOIDES, var. **Lemmoni** (Underw.), n. comb. *Aspidium mohrioides* D. C. Eaton, Ferns of N. A. ii. 251, t. lxxx. figs. 4–9 (1880), as to Lemmon plant figured. *P. Lemmoni* Underw. Our Nat. Ferns, ed. 6: 116 (1900).

Besides agreeing in all their fundamental specific characters, typical *P. mohrioides* and its vars. *scopulinum* and *Lemmoni* are amazingly similar in their selection of habitat. Bory's statement, based upon the observations of the original collectors of the Falkland plant, was that "elle croît dans les fentes des rochers" and the latest statement, by Skottsberg, is similar: "Rocky places, often deep down in crevices," while in the "stone-runs" "Two ferns are found in solitary tufts between the blocks, *Blechnum magellanicum* and *Polystichum mohrioides*, both finely developed."[1] How strikingly like Eaton's account of the type-station of var. *Lemmoni:* "Mr. Lemmon writes that this fern grows in loose and moist granitic soil, the root-stocks hidden under rocks;"[2] or like Bradley's account of the type-region of var. *scopulinum* in the Teton Canon of Idaho: "we climbed a sharp slope of stumbling rubbish, and then found ourselves on a narrow crest, overlooking an immense cañon, the Great Téton Canon . . . . The descent from this crest is very steep; and, in dodging falling masses of rock, started by those behind him, Mr. Bechler unfortunately

[1] Skottsberg, *A Botanical Survey of the Falkland Islands*, Kungl. Svenska Vetenskapsakad. Handl. 1. No. 3: 9, 114 (1913).
[2] Eaton, l. c. 252 (1880).

got a severe sprain."[1] At the isolated stations at the head of Snow Brook and on the ragged walls of Devil's Gulch on Mt. Albert, Quebec, where I have several times collected the plant, var. *scopulinum* is in dry rock-crevices (serpentine) or under broken rock whence its tough roots are most difficult of extraction. In the latter situations, where the tallest and least plicate fronds naturally develop, the fronds are often badly broken by the shifting rock-debris.

The range of the aggregate-species, *Polystichum mohrioides*, is, as already stated, similar to the ranges of several other plants, although differing, naturally, in many details. Thus *Myriophyllum elatinoides* Gaudichaud occurs on New Zealand, Chatham Island, Tasmania, the Falkland Islands, in the Andean region from Cape Horn to Ecuador, locally in Mexico, and it is known in the western United States in Arizona and Oregon.[2] *Empetrum rubrum* Vahl, characterized by white-woolly branchlets, leaves not reflexed in age and red drupes, occurs on the Falklands, along the Andes from Tierra del Fuego into Chile, on Masafuera (the western island of the Juan Fernandez group), and 2500 miles (4025 km.) east of Patagonia on Gough Island and on the islands of the Tristan da Cunha group. Outside the Subantarctic and southern Andean regions the only Empetrums are the Arctic circumpolar *E. nigrum* L. with branchlets at most minutely puberulent, the leaves reflexed in age and the berries black or purplish; and two species centering on the Gulf of St. Lawrence, *E. Eamesii* Fernald & Wiegand and *E. atropurpurcum* Fernald & Wiegand, both of which have the white-woolly branchlets, non-reflexed leaves and red berries as in the Subantarctic *E. rubrum* but differ from it in more trailing habit and in seed-characters.[3]

The quaint little genus *Lilaeopsis* of the *Umbelliferae* has three strongly marked species or groups of species. One, *L. lineata* (Michx.) Greene,[4] with the linear-clavate broadly round-tipped 3–6-jointed leaves scattered and solitary along the creeping filiform stem and

[1] Bradley in Hayden, U. S. Geol. Surv. of Terr. 6 Ann. Rep. 219 (1873).

[2] See Fernald, Rhodora, xxi. 124 (1919).

[3] For further discussion, see Fernald & Wiegand, Rhodora, xv. 213–217 (1913).

[4] It is probable that, when the original plant of *Hydrocotyle chinensis* L. Sp. Pl. i. 234 (1753) is critically examined, it will prove to be *Lilaeopsis lineata*, in which case we shall have to take up for the characteristic plant of Atlantic North America the highly inappropriate name *L. chinensis* (L.) Kuntze. The Linnean description strongly suggests *L. lineata*, although the phrase "Folia . . . *saepius bina ad articulos*" is not very satisfactory. No *Lilaeopsis* is known from Asia and Linnaeus evidently had his geographic data confused. His *Hydrocotyle chinensis* has generally been referred to the all-inclusive *L. lineata* (or *Crantzia lineata*), but it is worthy of note that upon examining the Linnean type Asa Gray made the memorandum "a species of *Crantzia*," not our species, with which he was familiar.

without obvious stipular margins, and with the fruits constricted at base or pyriform, is confined to saline mud of the Atlantic coast of the United States and of southwestern Nova Scotia. The second species *L. carolinensis* Coult. & Rose, a plant with long-petioled leaves having spatulate or oblong blades up to 2.5 cm. long and 1.5 cm. broad and comparatively large globose fruits, was originally described from the southeastern United States but it is apparently found also in Paraguay (for example, *Hassler*, no. 12,271) and elsewhere in temperate eastern South America.

The third and most widely spread group of species is typified by *L. attenuata* (Hook. & Arn.) Fernald,[1] a plant characteristic of southern South America and the Andes and represented northward by *L. occidentalis* Coult. & Rose and *L. Schaffneriana* (Schlecht.) Coult. & Rose and southward by the plants of the Falkland Islands, New Zealand, Tasmania and Australia which have erroneously passed as the Atlantic North American *L. lineata* or *Crantzia lineata* (Michx.) Nutt. The published illustrations[2] of fruits indicate considerable differences and it is possible that the austral series contains other species than *L. attenuata* and *L. Schaffneriana* but without better material than is now at hand it would be unwise to attempt further subdivision. The essential point in regard to the Australian, New Zealand, Tasmanian, Falkland, Argentine and Andean plants is, that they as well as the Mexican and Pacific North American plants all differ in fundamental characters from the Atlantic North American *L. lineata;* for in them all the more elongate and slender or often attenuate leaves are tufted along the comparatively stout creeping stem, not solitary and scattered as in *L. lineata;* when well developed they show 6–13 joints instead of only 3–6 (rarely 7) and they often have scarious stipular margins which frequently persist as old shreds. Whether they finally prove to be a single species, *L. attenuata*, or several, the plants of Subantarctic regions and of temperate and Andean South America constitute, with the Mexican and Pacific North American plants, a distinct section of *Lilaeopsis*.

It is thus evident that, although differing in details of distribution, *Polystichum mohrioides*, *Myriophyllum elatinoides*, the red-berried Empetrums and the species of *Lilaeopsis* centering about *L. attenuata*

[1] Lilaeopsis **attenuata** (Hook. & Arn.), n. comb. *Crantzia attenuata* Hook. & Arn in Hook. Bot. Misc. iii. 346 (1833).

[2] Hook. Fl. Antarct. ii. 287, t. C. (1847); Weddell, Chloris Andina, ii. t. 68 (1861); Coult. & Rose, Bot. Gaz. xxiv. 48, 49, figs. and 4 (1897); Jepson, Madroño, i. 139, fig. 25 (1923).

are similar in having interrupted Subantarctic and Andean ranges and in occurring in the northern hemisphere only in western America or in the region of the Gulf of St. Lawrence or in both areas.

II. THE DWARF ANTENNARIAS OF NORTHEASTERN AMERICA.

(Plate 142.)

The larger species of *Antennaria* of temperate eastern America are reasonably understood, but there is another series of highly localized species, chiefly of the calcareous areas from northern Labrador to Newfoundland, eastern Quebec and the James Bay region, which have not been so clearly defined. These are the plants which have passed chiefly as *A. alpina* (L.) Gaertn. and which, with it, form a rather natural group of species. In the cordilleran region of North America these plants have attracted much attention and a large number have been proposed as species. In eastern America they occur wholly beyond the habitations of resident botanists, unless we include in eastern America botanically quite similar Greenland. The Antennarias of Greenland have been carefully treated and beautifully illustrated by Porsild;[1] but in the region immediately to the west and southwest of Greenland these plants are collected only by the chance botanical visitor and our knowledge of them, like our knowledge of the whole vast region from Gaspé and Newfoundland northward, is in very rudimentary condition. However, the necessity of properly identifying two quite distinct species discovered in 1923 on the Shickshock Mountains makes it desirable to draw into convenient form our knowledge to date of these plants. The following synopsis of the species occurring south of Hudson Straits is therefore presented, not because it is final but because it may draw attention to a group about which much more information is needed. Further exploration of Newfoundland, Anticosti Island, the Gaspé Peninsula and the Labrador Peninsula will surely bring to light many additional species; and, to judge from our experience to date, they may be most hopefully looked for on barrens and mountains of limestone, basic schists and traps.

[1] Porsild, *On the Genus Antennaria in Greenland* (Arbejder fra den Danske Arktiske Station paa Disko, Nr. 9), Meddel. om Groenl. li. 267–281 (1915).

In order properly to orient the small-leaved boreal series here specially considered, the leading features of the other sections of the genus represented in eastern America are indicated in the key.

a. Basal leaves[1] erect, oblanceolate to elliptic-acuminate, 2–16 cm. long, similar to the cauline ones: involucres of the pistillate heads brown to blackish: plants sparingly to not at all stoloniferous.
A. eucosma Fernald & Wiegand and *A. pulcherrima* (Hook.) Greene.
a. Basal leaves spreading, forming depressed rosettes, strongly contrasting in outline with the cauline leaves: plants humifuse or freely stoloniferous *b.*
b. Larger basal leaves only 1.5–5 mm. wide, blunt or barely short-mucronate *c.*
c. All the involucral bracts of the pistillate heads[2] deep-brown, drab or blackish *d.*
d. Bracts subequal, narrow; the inner linear or lanceolate and acute: heads 1–6 *e.*
e. Rosette-leaves terminated by a short but distinct glabrous mucro: corollas 3.5–5 mm. long *f.*
f. Rosette-leaves glabrous and bright-green or grayish-pubescent above: cauline leaves distant; the upper with an oblong glabrous scarious appendage: corollas 4–5 mm. long: pits of the denuded receptacle 20–30, 0.3–0.4 mm. broad, much broader than the intermediate ridges....1. *A. alpina.*
f. Rosette-leaves canescent: cauline leaves crowded; the upper with a lanceolate pubescent scarious appendage: corollas 3.5–4 mm. long: pits of denuded receptacle 60–100, 0.1 mm. broad, about as wide as the blunt-edged intermediate ridges.....2. *A. Sornborgeri.*
e. Rosette-leaves canescent, blunt, the terminal mucro obsolete or in old weather-worn leaves barely visible: corollas 3–4 mm. long *g.*
g. Cauline leaves 9–15; the median and upper tapering to a slender subulate tip; only the very uppermost with a lanceolate scarious appendage..3. *A. cana.*
g. Cauline leaves 5–8; all but the lowermost with an oblong-lanceolate flat scarious tip 1.5–3 mm. long.....4. *A. vexillifera.*
d. Bracts in about 5 outwardly shorter series, oblong, obtuse: head solitary.....5. *A. pygmaea.*
c. At least the inner bracts of the pistillate heads with white or whitish tips: basal leaves whitened above with minute pubescence *h.*
h. The 1–3 uppermost cauline leaves with slender scarious terminal appendages: rosette-leaves blunt or short-mucronate: pistillate involucres 4–7 mm. high, with appressed-ascending bracts *i.*
i. Involucre of 4–6 series of distinctly unequal pale-brown bracts.....6. *A. straminea.*

[1] By basal leaves are meant not only those of the basal rosette but the new broad leaves terminating the stolons or basal offshoots. On account of weathering the former are often bruised and uncharacteristic.

[2] The only species of this series of which staminate plants are known is *A. nitida.* The descriptions of all the others, therefore, are drawn only from pistillate plants.

i. Involucre of 2–3 (–4) series of subequal or obscurely imbricated whitish, creamy or roseate bracts *j.*

j. Indument of the rosette-leaves close and lustrous as if varnished: cauline leaves 9–18: inflorescence glomerulate: corollas 3–3.5 mm. long *k.*

k. Upper cauline leaves with scarious tips 2–2.5 mm. long: involucre not viscid, with thin bracts; the thin tips of the inner series lacerate-erose.....7. *A. albicans.*

k. All but the uppermost cauline leaf merely short-mucronate: involucre viscid-hirsute, with thick and firm bracts; the thick tips entire or merely crenulate.....8. *A. nitida.*

j. Indument of the rosette-leaves a loose tomentum: cauline leaves 5–10: inflorescence a corymb: corollas 3.8–5 mm. long *l.*

l. Flowering stems 3–7 cm. high, not glandular: the upper cauline leaves with oblong-lanceolate scarious appendages 2–3 mm. long: heads 2–5: involucre not glandular: achenes smooth..9. *A. Peasei.*

l. Flowering stems 0.5–1.5 dm. high, glandular-hirsute above: upper cauline leaves with subulate or involute tips: heads 3–9: involucre glandular-viscid: achenes papillose..10. *A. subviscosa.*

h. The 5–8 upper cauline leaves with broad flat scarious appendages: rosette-leaves mucronate: involucre (except for the whitish tips) fuscous, 6–8 mm. high, its bracts loosely spreading.....11. *A. isolepis.*

b. Larger basal leaves mostly wider (rarely less than 5 mm. wide), distinctly mucronate or apiculate *m.*

m. Rosette-leaves comparatively small, 0.2–2.1 cm. wide, with only the midrib prominent to the tip beneath, the lateral ribs short and evanescent *n.*

n. Middle and upper cauline leaves terminated by a flat or merely involute scarious appendage....*A. neglecta* Greene, *A. appendiculata* Fernald, *A. spathulata* Fernald, *A. canadensis* Greene.

n. Middle and upper cauline leaves subulate-tipped or mucronate, without a scarious appendage (except sometimes on the bracteal leaves of the inflorescence).....*A. petaloidea* Fernald, *A. glabrifolia* Fernald, *A. neodioica* Greene.

m. Rosette-leaves comparatively large, 0.7–5.5 cm. broad, with 3–7 somewhat prominent ribs beneath ..*A. plantaginifolia* (L.) Richardson, *A. occidentalis* Greene, *A. fallax* Greene, *A. Brainerdii* Fernald, *A. Parlinii* Fernald, *A. solitaria* Rydberg.

1. A. ALPINA (L.) Gaertn. FIG. 1. Humifuse, with trailing subligneous branches up to 1 dm. long: stolons short and crowded: *rosette-leaves* oblanceolate, *0.8–1.8 cm. long,* 1.5–4 mm. wide, *narrowed to a distinct subulate-mucronate tip,* bright green or canescent above: flowering stem slender, subflexuous, up to 2.3 dm. high: *cauline leaves* 4–13, becoming distant by elongation of the stem; *the middle and upper with oblong glabrous scarious tips:* pistillate heads 1–5, sessile or short-stalked: involucre 7–9 mm. high, lanate at base: bracts about 3-seriate, subequal; the outer lanceolate to oblong, fuscous, acuminate; the inner attenuate: *corollas 4–5 mm. long:* longer pappus-bristles 5–6 mm. long: achenes glabrous, 1.3–1.5 mm. long: *pits of*

the denuded receptacle 20–30, 0.3–0.4 mm. broad, much broader than the intermediate ridges.

Three varieties with us:

Flowering stems 2–12 cm. high, with 4–9 leaves: heads (when more than 1) in a close corymb or glomerule.
  Rosette-leaves green and glabrous above.....Var. *typica.*
  Rosette-leaves canescent-tomentose above.....Var. *canescens.*
Flowering stems elongating to 2–2.3 dm., with 9–13 leaves: rosette-leaves green and glabrous above: heads 1–2, the lower (when present) on a pedicel 1–1.5 cm. long .....Var. *ungavensis.*

Var. **typica.** *Gnaphalium alpinum* L. Sp. Pl. ii. 856 (1753). *A. alpina* (L.) Gaertn. Fruct. ii. 410 (1791).—Arctic America, south to Kangalaksiorvik Bay, Labrador (*Owen Bryant*) and mountains of British Columbia; also northern Eurasia. *Fl.* July–September.

Var. CANESCENS Lange, Fl. Dan. xvi. (fasc. xlvii.) 9, t. 2786, fig. 1 (1869); Fernald, RHODORA, xviii. 237 (1916). *A. angustata* Greene, Pittonia, iii. 284 (1898). Var. *cana* Fernald & Wiegand, RHODORA, xiii. 24 (1911), in part.—The commoner extreme in eastern America, extending south to Port Manvers, Labrador (*Delabarre*).

Var. UNGAVENSIS Fernald, RHODORA, xviii. 238 (1916).—Known only from the type-region, Stillwater River, Ungava District.

2. A. SORNBORGERI Fernald. FIG. 2. Humifuse, with trailing subligneous branches up to 1 dm. long: stolons very short and crowded: rosette-leaves oblanceolate, 6–12 mm. long, 1.5–2 mm. wide, narrowed at summit to the short-mucronate tip, canescent-pannose: *flowering stem stiffly erect,* 0.4–1.1 dm. high: *cauline leaves rather crowded,* 9–12, linear, 5–15 mm. long, 0.5–1.5 mm. wide; the *upper with villous lanceolate scarious tips:* pistillate heads 1–3, sessile, campanulate: involucre 6–7 cm. high, lanate at base: bracts about 3-seriate, subequal; the outer lanceolate, brown; the inner linear-attenuate, yellowish-brown, erose-serrulate: *corollas 3.5–4 mm. long:* longer pappus-bristles 4–5.5 mm. long: achenes glabrous, 1.2–1.4 mm. long: *pits of the denuded receptacle 60–100, 0.1 mm. broad, about as wide as the blunt-edged intermediate ridges.*—RHODORA, xviii. 237 (1916).—Rama, LABRADOR (*J. D. Sornborger*). *Fl.* August.

3. A. CANA (Fernald & Wiegand) Fernald. FIG. 3. Humifuse, the crowded leafy stolons very short (up to 2 cm. long): rosette-leaves narrowly cuneate-obovate or broadly oblanceolate, obtuse, not mucronate, broad-based, 3–11 mm. long, 2–5 mm. broad, white above with dense minute tomentum: flowering stems 2.5–12 cm. high, slender: *cauline leaves 9–15,* rather crowded, linear; the lower 8–15 mm. long, 1–2 mm. broad, subulate-tipped; *the median and upper subulate-tipped; only the uppermost with a lanceolate scarious tip:* pistillate heads (1–)2–6, campanulate, corymbose, on pedicels up to 1 cm. long: involucres 5–7 mm. high, lanate at base: bracts 3-seriate, subequal, very thin; the outer oblong, brown; the inner lanceolate, tawny, slightly fimbriate: *corollas 3.5–4 mm. long:* longest pappus

4–5.5 mm. long: achenes glabrous, 1.2–1.6 mm. long: *pits of the mature denuded receptacle 60–100, 0.1 mm. broad, much broader than the acute intermediate ridges.*—RHODORA, xviii. 236 (1916). *A. alpina*, var. *cana* Fernald & Wiegand, RHODORA, xiii. 24 (1911), in part.—Dry limestone barrens, western NEWFOUNDLAND. *Fl.* July, early August.

4. A. **vexillifera**, spec. nov. (FIG. 4), humifusa, stolonibus foliosis confertis perbrevibus (ad 2 cm. longis); foliis basalaribus late spathulatis vel cuneato-obovatis apice rotundatis vix mucronatis 5–12 mm. longis 3–4 mm. latis supra albidis, tomento denso minuto; caule florifero 6–10 cm. alto gracili; foliis caulinis 5–8 subdistantibus, imis oblanceolatis, mediis superioribusque linearibus 5–10 mm. longis cum apice scarioso oblongo-lanceolato 1.5–3 mm. longo munitis; capitulis femineis 1–5 corymbosis hemisphaerico-campanulatis basi rotundatis; involucro 6–7 mm. alto basi lanato; bracteis 2–3-seriatis subaequalibus tenuissimis, exterioribus anguste oblongis obtusis vel subacutis basi castaneis, interioribus lanceolatis fulvis plerumque acuminatis; corolla 3–4 mm. longa, lobis purpurascentibus; stylo purpurascenti; planta mascula ignota.—Matane County, QUEBEC: dry open gravel on the tableland-saddle (altitude about 1070 m.) between Mt. Mattaouisse and Mt. Collins, July 8, 1923, *M. L. Fernald, Ludlow Griscom, K. K. Mackenzie, A. S. Pease & L. B. Smith*, no. 26,056 (TYPE in Gray Herb.).

Closely simulating *A. cana* but at once distinguished by its cauline leaves. In *A. cana* these are 9–15, the median and upper ones tapering to a slender subulate tip, only the very uppermost with a scarious tip. In *A. vexillifera* the cauline leaves are fewer (5–8) and all but the very lowermost bear conspicuous broad pennant-like scarious tips (whence the specific name.)

A. vexillifera has the cauline leaf-tips of *A. alpina*, but that species has much narrower and distinctly mucronate basal leaves, larger heads with narrower and more fuscous involucral bracts and longer corollas (4–5 mm. long).

5. A. PYGMAEA Fernald. FIG. 5. Dwarf, *3–4.5 cm. high, monocephalous*, humifuse; the assurgent *stolons very short, not obviously elongated: basal leaves* oblanceolate, mucronate, 8–14 mm. long, 2.5–3.5 mm. wide, *glabrous or glabrate above; the cauline about 9, crowded*, linear-oblanceolate, 6–14 mm. long, lanate beneath, *glabrous or glabrate above, with a* lanceolate or narrowly deltoid *glabrous flat scarious tip* 1.5–2 mm. long: *pistillate involucre* hemispherical, 7 mm. high, 12–13 mm. broad (in the dried material), lanate at base: *bracts in about 5 series, definitely imbricated, oblong, obtuse;* the outer *fuscous*, with a short stramineous tip; the inner with a long obtuse stramineous tip: corollas 4 mm. long: staminate plant unknown.—RHODORA, xvi. 129

(1914).—Known only from northeastern Labrador[1] (*Weitz et al.*). *Fl.* August.

6. A. straminea Fernald. Fig. 8. Plant humifuse, the leafy stolons very short or slightly elongated (up to 7 cm. long): *leaves of the rosette spatulate,* subacute, *barely mucronate,* 5–12 mm. long, 2–4 mm. broad, *white above with dense fine tomentum: flowering stem* 3–14 cm. high, slender, *remotely leafy: cauline leaves* 8–10, linear, 6–14 mm. long, 1–2 mm. wide; the median attenuate to a dark subulate tip; *the upper with a linear scarious tip:* pistillate heads 1–7, usually in a close corymb, hemispheric-campanulate, rounded at base: involucre 5.5–7 mm. high, 4.5–8 mm. broad (in the dried specimens), *with 4–6 series of very distinctly imbricated bracts: the outer bracts ovate or oblong, brown,* slightly lanate at base, with a thin chartaceous stramineous obtuse or subacute tip; the median oblong, with a deltoid obtuse or subacute stramineous tip; the inner with a lanceolate erose stramineous tip: corollas 3.7–4.2 mm. long: achenes glabrous, 1.4 mm. long: longer pappus-bristles 4.5–5 mm. long: style yellowish, becoming brown: staminate plant unknown.—Rhodora, xvi. 130 (1914).—Rocky or turfy calcareous barrens and headlands bordering Notre Dame and Ingornachoix Bays, Newfoundland. *Fl.* July, early August.

7. A. albicans Fernald. Fig. 6. Plant humifuse, the leafy stolons very short (up to 2 cm. long): *basal leaves spatulate,* subacute or obtuse, *scarcely mucronate,* 3–8 mm. long, 2–3 mm. wide, *white above with dense minute somewhat shining tomentum:* flowering stem 4.5–9 cm. high, slender, somewhat remotely leafy: *cauline leaves* 9–15, linear, 6–12 mm. long, 1–2 mm. wide; the median attenuate, subulate at tip; *the upper with a glabrous linear scarious tip 2–2.5 mm. long:* pistillate heads (1–)2–5 in *glomerules,* turbinate-campanulate: *involucre*

[1] As noted when *A. pygmaea* was published, this is the plant which Gray in the *Synoptical Flora* treated as *A. carpathica* (Wahlenb,) R. Br.: "Labrador (a monocephalous form!)." But Gray, of course, was writing long before the intensive and highly productive studies of the genus had begun. *A. carpathica* belongs to the very strongly defined non-stoloniferous group of species with erect and elongate basal leaves (the section including *A. eucosma* Fernald & Wiegand, *A. pulcherrima* (Hook.) Greene, *A. lanata* (Hook.) Greene, etc.), while Gray's "monocephalous form" is a humifuse plant with depressed rosettes of tiny leaves. Dr. Theodor Holm, lamenting the disappearance of the name *A. carpathica* from American literature, cites Gray's record of the Labrador plant (*A. pygmaea*), which was not understood by Gray, as proof that *A. carpathica* does grow in America, though in Labrador it so far departs from the European type as to have only a single head (Rhodora, xxii. 142); and he reinforces his argument, that *A. carpathica* is North American, by the statement that, "Having examined a number of specimens of *A. lanata* Greene I find it impossible to distinguish them from *A. carpathica.*" I have before me 19 collections of *A. carpathica* of Europe and 26 of the Rocky Mountain *A. lanata.* In the former 2 to 4 of the median and upper cauline leaves end in a lance- or linear-subulate scarious tip, only 1 or 2 of the uppermost leaves ever showing dilated appendages; but in *A. lanata* 4 to 9 of the cauline leaves have broad and conspicuous pennant-like appendages. This perfectly obvious character, supplementing the broader leaves, the smaller heads, shorter corollas and shorter pappus, clearly distinguishes *A. lanata* from *A. carpathica* and it is doubtful if other students of *Antennaria* will follow Holm in forcing it and the wholly different *A. pygmaea* back into the European *A. carpathica.*

4.5–6 mm. high, 4.5–6 mm. wide (in dried specimens): *bracts* in 2–3 series, *subequal, thin;* the outer 3–4 mm. long, oblong or lanceolate, obtuse or subacute, straw-color or brown, green and a little lanate at base; *inner* oblong, obtuse, *lacerate-erose, milk-white:* corollas 3–3.3 mm. long: achenes glabrous, 0.8–1 mm. long: longer pappus-bristles 4–4.3 mm. long: staminate plant unknown.—Rhodora, xvi. 197 (1914).—Dry limestone shingle, northern domes of Table Mt., Port à Port Bay, Newfoundland. *Fl.* July.

8. A. nitida Greene. Fig. 9. Resembling *A. albicans*. Pistillate plant with the stiffish stolons up to 6 dm. long: basal leaves 0.5–1.5 cm. long: flowering stems 0.5–2 dm. high: *cauline leaves 9–18; the middle and upper merely short-mucronate:* heads 5–9 in a glomerule: *involucre 6–7 mm. high, viscid-hirsute: bracts* about 4-seriate, *very unequal; the outer* 3–4.5 mm. long, oblong, obtuse, *whitish*, green and densely lanate at base; *the inner* white, gradually narrower, obtuse, *entire or barely erose:* corollas 3–3.5 mm. long: achenes 0.8–1.2 mm. long: longest pappus-bristles 5 mm. ong. Staminate plant with glomerules 1–2 cm. in diameter: involucre with firm creamy or yellowish oblong to obovate entire to merely cremulate bracts: corollas 3.5 mm. long: pappus 4–4.5 mm. long, upwardly barbellate; the slightly dilated (rarely broad) tips crenate.—Pittonia, iii. 283 (1898). *A. arida viscidula* E. Nelson, Proc. U. S. Nat. Mus. xxiii. 710 (1901). *A. viscidula* Rydberg, Fl. Colo. 369 (1906).—Dry limestone soil, Charlton Isl., James Bay, Quebec to Athabasca and Utah. *Fl.* late June, July.

9. A. **Peasei**, spec. nov. (Fig. 11), humifusa, stolonibus foliosis confertis perbrevibus (ad 2 cm. longis); foliis basilaribus late oblanceolatis vel anguste cuneato-obovatis 7–12 mm. longis 2–4.5 mm. latis mucronatis supra albidis, tomento denso minuto; caule florifero 3–7 cm. alto gracili; foliis caulinis 5–7 lineari-lanceolatis 0.8–1.5 cm. longis, imis mediisque subulato-mucronatis, superioribus 2 vel 3 apice scarioso oblongo-lanceolato 2–3 mm. longo munitis capitulis femineis 2–5 dense corymbosis hemisphaerico-campanulatis basi rotundatis; involucro 6–7 mm. alto basi lanato; bracteis 2–3-seriatis subaequalibus chartaceo-petaloideis, exterioribus oblongis subacutis pallide brunneis basi subcastaneis, interioribus similibus acuminatis lacteis; corollis 3.8–5 mm. longis; stylo purpurascenti; achaeniis glabris; planta mascula ignota.—Matane County, Quebec: talus of mica-schist, chimney east of Razorback Ridge (altitude 850–1000 m.), Mt. Logan, July 13, 1923, *A. S. Pease & L. B. Smith*, no. 26057 (type in Gray Herb.).

Related to *A. albicans* of western Newfoundland and *A. subviscosa* of Rimouski County, Quebec. From the former distinguished by the distinctly mucronate and loosely tomentose basal leaves, the few cauline leaves, the larger heads, the acuminate inner involucral bracts and the longer corolla; *A. subviscosa* is a coarser plant with trailing

branches often 4 or 5 dm. long. It has 7–9 cauline leaves, the uppermost with subulate or involute tips; its heads are more numerous (3–9) and its glandular-viscid involucres have more definitely imbricated bracts.

Various cordilleran species, *A. umbrinella* Rydberg, *A. pulvinata* Greene, etc., are related to *A. Peasei* but I am unable to find any species to which it can be satisfactorily referred.

10. A. SUBVISCOSA Fernald. FIG. 10. Plant densely humifuse, the *trailing branches subligneous*, often 4–5 dm. long; stolons very short and crowded: *leaves of the rosettes spatulate, obtusish, scarcely mucronate* or with a very short mucro, 0.5–1.5 cm. long, 2–5 mm. broad, densely white-tomentose: *flowering stems* 0.5–1.5 dm. high, white-tomentose throughout, *glandular-hirsute above: cauline leaves* 7–10, tomentose; the lower linear-oblanceolate, mucronate, 1.5–2.5 cm. long; *the upper* linear-attenuate, *with a subulate or involute subscarious pubescent tip:* pistillate heads 3–9, densely or loosely corymbose: *involucre* turbinate-campanulate, 5–6.5 mm. high: *bracts* about 3-seriate; *the outer* 3–4 mm. long, oblong, subherbaceous, greenish or stramineous, often rose-tinged, *glandular-viscid*, with a thin obtuse *cream-colored or rose-pink tip;* interior narrower, acutish: corollas 3.8–4.3 mm. long: *achenes papillose*, 1–1.2 mm. long: longer pappus-bristles 4.5–5 mm. long: staminate plant unknown.—RHODORA, XVI. 131 (1914).—Cold north-facing limestone sea-cliffs east of Bic, Rimouski Co., QUEBEC. *Fl.* July.

11. A. ISOLEPIS Greene. FIG. 7. Humifuse, the leafy stolons up to 7 cm. long: *rosette-leaves oblanceolate or obovate*, subacute or obtuse, *short mucronate, 0.8–2.5 cm. long, 2–7 mm. broad*, densely *white-tomentose* above: flowering stems 0.7–2.5 dm. high, flexuous: cauline *leaves 9–18*, linear-oblanceolate, tomentose, 1.5–3 cm. long, 2–4 mm. broad; the lower with subulate tips; *the 5–8 upper with broad flat scarious tips:* heads 5–9, corymbose: pistillate involucres 6–8 mm. high: *bracts of about 3 lengths, fuscous except for the oblong erose white or whitish widely spreading petal-like tips:* corollas 3–3.7 mm. long: *achenes sparingly papillose*, 1–1.2 mm. long: longest pappus-bristles 4.5–5.5 mm. long: staminate plant unknown.—Ottawa Nat. XXV. 41 (1911).—Coast of Hudson Strait, UNGAVA DISTRICT, and south near the outer coast at least to Port Manvers, LABRADOR. *Fl.* July, August.

EXPLANATION OF PLATE 142.

FIG. 1, *Antennaria alpina* × 1; 1a, tip of median cauline leaf × 4. FIG. 2, *A. Sornborgeri* × 1; 2a, tip of median cauline leaf × 4. FIG. 3, *A. cana* × 1; 3a, tip of median cauline leaf × 4. FIG. 4, *A. vexillifera* × 1; 4a, tip of median cauline leaf × 4. FIG. 5, *A. pygmaea* × 1; 5a, tip of median cauline leaf × 4. FIG. 6, *A. albicans* × 1; 6a, tip of median cauline leaf × 4; 6b, inner bract of involucre × 4. FIG. 7, *A. isolepis* × 1; 7a, tip of median cauline leaf × 4. FIG. 8, *A. straminea* × 1; 8a, tip of median cauline leaf × 4. FIG. 9, *A. nitida* × 1; 9a, tip of median cauline leaf × 4; 9b, inner bract of involucre of staminate plant × 4. FIG. 10, *A. subviscosa* × 1; 10a, tip of median cauline leaf × 4; 10c, central flower and achene × 4. FIG. 11, *A. Peasei* × 1; 11a, tip of median cauline leaf × 4; 11c, central flower and achene × 4.

III. THE EASTERN AMERICAN REPRESENTATIVES OF ARNICA ALPINA.

(Plate 143.)

In 1905 I published[1] a synopsis of the species of *Arnica* known in northeastern America and at that time predicted that "doubtless many other species will be found, especially on the mountains and cliffs of eastern Quebec." Although the prediction has not yet been wholly fulfilled, two very distinct new species have been discovered, one on the Long Range of western Newfoundland, the other in the Shickshock Mountains. In determining the exact relationships of one of these plants, discovered in 1923 on Mt. Logan and the neighboring Mt. Mattaouisse in Matane County, Quebec, it has seemed appropriate to present a new treatment of the eastern species with few and small cauline leaves and with white and merely barbellate pappus (*A. alpina* and its allies) and to publish Miss Brackett's drawings of these species. In order to show the contrast between these plants and the well known *A. mollis* Hook. of the Rocky Mountains and of the Gaspé Peninsula and of northern New England and northern New York, the latter species is also included in the key, although it seems unnecessary to discuss it in detail.

a. Stem-leaves 1–4 pairs (sometimes scattered small bracts above), at least the upper entire or only sparingly toothed: pappus white or whitish; its bristles merely barbellate *b.*
  b. Achenes copiously hirsute from base to summit *c.*
    c. Lower leaves entire or with only remote irregular teeth *d.*
      d. Base of involucre and summit of peduncle villous-lanate *e.*
        e. Leaves nearly glabrous or only minutely glandular-hispid: involucral bracts 15–20, narrowly lanceolate, 2–3 mm. broad, only sparingly pubescent above the middle: ligules with blunt lobes only 1–2 mm. long.....1. *A. alpina.*
        e. Leaves loosely villous: involucral bracts 8–10, narrowly rhombic, 3–3.5 mm. broad, loosely villous to the tip: ligules with acutish lobes 3–5 mm. long.....2. *A. pulchella.*
      d. Base of involucre and summit of peduncle viscid-villous but hardly lanate *f.*
        f. Leaves glabrous or merely minutely pilose on nerves and margin, entire; the cauline lanceolate to oblong: stem glabrous or essentially so at base: involucral bracts oblanceolate, 1 cm. long, glandular-villous at base, only sparingly pilose or glabrate above: ligules with blunt lobes only 1–2 mm. long.....3. *A. plantaginea.*
        f. Leaves glandular-puberulent and viscid-villous, irregularly dentate; the cauline linear or linear-

[1] Rhodora, vii. 146–150 (1905).

lanceolate: stems viscid-villous at base: involucral bracts linear- to lance-attenuate, 1.2–1.5 cm. long, uniformly viscid-villous: ligules with acutish lobes 3–5 mm. long.....4. *A. Sornborgeri.*

c. Lower leaves regularly dentate *g.*

g. Disk-corollas 6–8 mm. long, with glabrous or only sparingly setose lobes; the densely pilose portion of the tube and throat 3.5–6 mm. long: mature pappus 5–8 mm. long, bright-white.....5. *A. chionopappa.*

g. Disk-corollas 9–10 mm. long, with copiously setose lobes; the densely pilose portion of the tube and throat 7–9 mm. long: mature pappus 9–10 mm. long, creamy-white.....6. *A. gaspensis.*

b. Achenes glabrous or nearly so below the middle.....7. *A. Griscomi.*

a. Stem-leaves 3–5 pairs, all evenly dentate: pappus yellowish-brown or olive-tinged; its bristles subplumose.....8. *A. mollis.*

1. A. ALPINA Olin & Ladau. FIG. 1. *Stem* 0.5–3 dm. high, *sparingly short-villous below,* densely so above, copiously villous-lanate at tip: *leaves nearly glabrous or minutely glandular hispid;* the basal linear-lanceolate, 3–9 cm. long, 0.4–1.6 cm. broad, entire or with few remote small teeth; cauline 1–3 pairs, entire, sessile, the lowest usually much longer than the reduced upper ones: heads solitary (rarely 2–4), 4–6 cm. broad: *involucre densely villous-lanate at base; its 15–20 narrowly lanceolate* long-acuminate usually purplish *bracts only sparingly pubescent above the middle,* 1.2–1.5 cm. long, *2–3 mm. broad: ligules 10–15, with 3 blunt lobes 1–2 mm. long:* achenes hirsute: pappus cream-white; its bristles barbellate.—Diss. 11 (1799), acc. to Ind. Kew. *A. montana, β alpina* L. Sp. Pl. ii. 884 (1753). *A. angustifolia* Vahl, Fl. Dan. ix. t. 1524 (1818).—Arctic regions, south to rocky slopes of the Torngat Mts., Labrador, Mosquito Bay, Ungava Distr., northern Manitoba, and Alaska; arctic and alpine Eurasia. *Fl.* August.

2. A. PULCHELLA Fernald. FIG. 2. *Stem* 1–1.8 dm. high, *villous,* especially above, *with white hairs 1–2 mm. long* mixed with minute stipitate glands: *leaves loosely villous* on both surfaces; the basal lanceolate or oblanceolate, 3–15 cm. long, 0.5–1.5 cm. broad, entire or remotely callous-dentate; cauline 1–2 pairs, entire: head solitary, 4.5 cm. broad: *involucre densely villous-lanate at base; its 8–10 narrowly rhombic* long-attenuate *bracts* glandular and *loosely villous to the tip,* 1.5 cm. long, *3–3.5 mm. broad: ligules* about 10, *with 3–4 sharp lobes* (*the longest 3–5 mm. long*): achenes hirsute: pappus white, barbellate.—RHODORA, xvii. 18 (1915).—Dry exposed limestone ledges and shingle, Table Mt., Port à Port Bay, Newfoundland. *Fl.* July.

3. A. PLANTAGINEA Pursh. FIG. 4. *Stem 1.5–4.5 dm. high, glabrous or only very sparingly villous-hispid below,* glandular-puberulent at summit: *leaves glabrous or minutely pilose on the nerves and margins, entire; the basal oblong to oblanceolate,* 0.6–1 dm. long, 1.2–2 cm. broad; cauline 3–4 pairs, sessile, the lower 7–13 cm. long, the upper much reduced: heads 1–3, 4–5 cm. broad: *involucre* glandular-villous at

base; *its 10–12 oblanceolate bracts 1 cm. long, sparingly pilose or glabrate above the base: ligules* 10–15, *with 3 blunt lobes 1–2 mm. long:* achenes hispid: pappus white, barbellate.—Fl. 527 (1814); Fernald, RHODORA, vii. 147 (1905). *A. angustifolia* Torr. & Gray, Fl. ii. 449 (1843), in part, not Vahl. *A. alpina* Gray, Syn. Fl. i. pt. 2: 382 (1886), in part, not Olin & Ladau. *A. alpina*, var. *Lessingii* Fernald & Sornborger, Ott. Nat. xiii. 106 (1899), in part, not Gray.—Banks of mountain-brooks, etc., Ramah to Nain, Labrador, west to Kooksoak River, Ungava District. *Fl.* August.

4. A. SORNBORGERI Fernald. FIG. 3. *Stem* 1.5–2 dm. high, *viscid-villous throughout,* densely so at summit: *leaves glandular-puberulent and viscid-villous, irregularly dentate;* the basal linear-lanceolate to narrowly oblong, 6–9 cm. long, 0.8–1.6 cm. broad; cauline 3 pairs, linear to lanceolate: head solitary, 4.5–6 cm. broad: *involucre uniformly viscid-villous throughout; its 10–12 linear- to lance-attenuate bracts 1.2–1.5 cm. long: ligules* 10–15, *with acutish lobes 3–5 mm. long:* achenes hirsute: pappus white, barbellate.—RHODORA, vii. 147 (1905).—Rocky banks of streams, Torngat Mts., Labrador. *Fl.* August, September.

5. A. CHIONOPAPPA Fernald. FIG. 5. *Stem* 0.7–4 dm. high, *loosely or sparingly villous: leaves sparingly villous or glabrate; the basal* lanceolate to narrowly ovate, *regularly dentate,* 0.3–1.8 dm. long, 0.5–3.3 cm. broad; cauline 2–4 pairs, the lower slender-petioled and resembling the basal, the upper sessile and much smaller: heads 1–4, 3–4 cm. broad: *involucre villous throughout; the 10–15 linear- to lance-attenuate bracts 7–13 mm. long:* ligules 10–15, with short bluntish lobes: *disk-corollas 6–8 mm. long,* with glabrous or only sparingly setulose lobes; *the densely pilose portion of the tube and throat 3.5–6 mm. long: achenes* densely short-setulose, 4–6 mm. long; the ascending *white hairs about equaling one-half the diameter of the achene: pappus bright-white, in fruit 5–8 mm. long.*—RHODORA, vii. 148 (1905).—Calcareous ledges, shingle, cliffs and river-gorges, Table Mt., Port à Port Bay, Newfoundland; Cap-Rosier, Gaspé Co., Quebec to the Tobique River, New Brunswick. *Fl.* late June–early August.

6. A. GASPENSIS Fernald. FIG. 6. *Stem* 3–4 dm. high, villous below, *glandular-puberulent above: leaves sparingly pilose on both surfaces,* lanceolate; the lower with sharp spreading teeth, 6–12 cm. long, 1.2–2.3 cm. broad; the 3 or 4 pairs of cauline sessile, the upper much reduced: heads 1–4, 4–5 cm. broad: *involucre glandular puberulent and sparingly pilose; its 8–10 oblong bracts* 1 cm. long, *with triangular tips: ligules* about 10, *sharply lobed: disk-corollas slenderly funnelform, 9–10 mm. long, with copiously setose lobes; the densely pilose portion of the tube and throat 7–9 mm. long:* achenes hirsute with short and *long hairs, the latter nearly equaling the diameter of the achene: pappus cream-white, in fruit 9–10 mm. long.*—RHODORA, vii. 148 (1905).—Calcareous ledges and cliffs, Cap Tourelle, Gaspé Co., Quebec. *Fl.* July.

7. A. **Griscomi,** n. sp. (FIG. 7), rhizomate gracili 0.4–1 dm. longo

horizontali vel oblique adscendente; caule solitario (rarissime 2–3) piloso supra sparse villoso-hirsuto 0.8–2.5 dm. alto; foliis rosulatis lanceolato-ellipticis 3–10 cm. longis 0.5–2 cm. latis subacuminatis basi angustis plus minusve petiolatis supra papillosis vel sparsissime villosis glabratisque ciliatis margine calloso-serratis, dentibus 3–7-jugis; foliis caulinis 1–2-jugis, inferioribus oblanceolatis vel oblongis vel lanceolato-ovatis remote serratis vel integris glabris vel papillosis, superioribus valde reductis apice calloso-subulatis; pedunculis 1–3 nudis vel bracteolatis, bracteolis linearibus apice subulati-filiformibus; capitulis 2.5–4 cm. diametro; involucro 1–1.5 cm. alto basi minute piloso supra glabro; bracteis 8–10 anguste rhomboideis 2–3 mm. latis acuminatis ciliatis dorso glabris, paginis interioribus apice villosis; ligulis 9–12 luteis, lamina 1–1.5 cm. longa 4–5 mm. lata 7–9-nervata apice 3-dentata, dentibus longioribus 0.5–1 mm. longis; corollis disci 6–7 mm. longis, tubo villoso 2.5–3.5 mm. longo; achaeniis 3–3.5 mm. longis glabris vel ad apicem sparse breviterque hirsutis; pappo 6–7 mm. longo albo, setis barbellulatis.—Matane County, QUEBEC: moist rock-walls and shelves of hornblende-schist at head (altitude about 1070 m.) of Big Chimney, Mt. Mattaouisse, July 8, 1923, *M. L. Fernald, Ludlow Griscom, K. K. Mackenzie, A. S. Pease & L. B. Smith*, no. 26,082; same station, August 20, 1923, *Fernald & Smith*, no. 26,085; dry schistose crests and talus of Razorback Ridge (altitude 850–1000 m.), Mt Logan, July 13, 1923, *Pease & Smith*, no. 26,083; cold chimneys in the schist at about 900–1000 m. altitude, south of Fernald Pass, Mt. Mattaouisse, August 20, 1923, *Fernald & Smith*, no. 26,084 (TYPE in Gray Herb.).

Named for Ludlow Griscom, professional ornithologist, keen amateur botanist, tireless explorer and choice companion, who first discovered the plant which subsequently proved to be somewhat generally distributed on the cold walls of Mts. Mattaouisse and Logan.

Arnica Griscomi belongs to the group of species nearly related to *A. alpina*. From all of them it is distinguished by its achenes being glabrous at base or often nearly throughout; *A. alpina, A. plantaginea, A. chionopappa, A. gaspensis* and *A. arnoglossa* Greene, the five species to which it is most nearly related, having the achenes densely hirsute with comparatively long trichomes. In *A. alpina*, furthermore, the entire basal leaves are very narrow, and the involucre is densely lanate at base and it has more numerous and narrower bracts. *A. chionopappa* has the more numerous linear- or lance-attenuate bracts villous throughout, the ligules more numerous, the villous portion of the disk-corolla longer, and the achenes longer; *A. plantaginea* has the stem glabrous or essentially so at base but distinctly glandular above and its leaves are entire; *A. gaspensis* (which is

A. E. Brackett del.

DWARF ANTENNARIAS.

A. E. Brackett del.

REPRESENTATIVES OF ARNICA ALPINA.

known only at the type-station where it has thrice been collected) has the involucral bracts glandular as well as pilose, its disk-corollas slender and longer than in others of the group and with the villous tube more than twice as long as in *A. Griscomi,* its achenes nearly twice as long and its pappus creamy- or sordid-white instead of snow-white. *A. arnoglossa,* described from the Black Hills, is densely glandular-puberulent above and the very young achenes (the only ones seen) are definitely longer than the mature ones of *A. Griscomi.*

Explanation of Plate 143.

Fig. 1, *Arnica alpina* × 1; 1a, disk-flowered × 4; 1b, tip of ligule × 4 Fig. 2, *A. pulchella* × 1; 2b, tip of ligule × 4. Fig. 3, head of *A. Sornborgeri* × 1. Fig. 4, *A. plantaginea* × 1. Fig. 5, *A. chionopappa* × 1; 5a, disk-flower × 4. Fig. 6a, disk-flower of *A. gaspensis* × 4. Fig. 7, *A. Griscomi* × 4; 7a, disk-flower × 4.

(To be continued)

CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY.—New Series.—No. LXXII.

(*Continued from page 108.*)

IV. SOME SENECIOS OF EASTERN QUEBEC AND NEWFOUNDLAND.

(Plate 144.)

Senecio resedifolius.—In 1818 Ledebour described from the Altai of Siberia a monocephalous Senecio under the name *Cineraria lyrata*.[1] The plant was subsequently collected by Bunge, Fischer, Tiling, Turczaninow, Charles Wright and others in the Altai and Baikal regions or at other points in Siberia eastward to Amur and the coast of Bering Straits. It is a well marked but highly variable plant, a single variation of which was illustrated in Reichenbach's *Iconagraphia*.[2] In 1831 Lessing gave a beautifully detailed description of one of Chamisso's plants from Bay St. Lawrence or Gulf of St. Lawrence on the Asiatic side of Bering Straits as *Senecio resedifolius*,[3] and as a synonym he cited *Cineraria lyrata* Less., Lessing's specific name being unavailable on account of the older *Senecio lyratus* L. f.

Gradually the knowledge of *Senecio resedifolius* was extended until, in 1867, Herder[4] recognized it as a wide-ranging species, extend-

[1] Ledeb. Mém. Acad. Pétersb. v. 576 (1818).

[2] Reichenb. Ic. Bot. Crit. ii. 1, t. 101 (1824).

[3] Lessing, Linnaea, vi. 243 (1831). Lessing's account says clearly that the original habitat was "In sinu St. Laurentii cel. de Chamisso" and one of the original labels in Chamisso's hand, in the Gray Herbarium, is equally explicit: "Sin. St. Laurent." This, of course, is the well known Bay or Gulf of St. Lawrence on the west side of Bering Straits, where many types were collected by Chamisso Greenman in his monograph (Ann. Mo Bot. Gard. iii. 99) erroneously cites the Chamisso material as coming from "Alaska: St. Lawrence Island, *Chamisso*."

[4] Herder, Reisen in den Süden von Ostsibirien, iii. Heft. 2: 116 (1867).

ing from Bering Straits across arctic Siberia and south to the Altai, and along the coast of Alaska to "Brittisch Nord-Amerika." In 1916 its range, as understood by the monographer of the genus, Greenman,[1] was essentially the same, he citing specimens from as far south as the Aleutian and Shumagin Islands and "Mucklung River" (supposed to be in British Columbia). At the same time *Senecio Fernaldii* Greenman,[2] from a spur of the Long Range in Newfoundland, was described as a new species. The type of the latter was a single rather exceptional individual,[3] but it showed characters in the foliage and in its lack of ligules which seemed to separate it from the ordinarily radiate *S. resedifolius*. Subsequently, however, the Newfoundland plant (figs. 1[3] and 1[4]) has been twice collected in quantity at the type-locality, in July, 1914 (*Fernald & St. John*, no. 10,873) and in July, 1921 (*Mackenzie & Griscom*, no. 10,483). A few individuals of these later collections are good matches for the type; but of the 47 plants of these two collections preserved in the Gray Herbarium all but these half-dozen individuals show such departures in the toothing and shape of the basal leaves, development and cutting of the cauline leaves, and development of ligules that, by those who have not seen them growing in one area of limestone shingle, and who might depend too reliantly upon the key-characters used by Greenman, "heads . . . discoid," and "Lower leaves sharply dentate," they might readily be mistaken for several species. The basal leaves may be sharply dentate, rounded-dentate or shallowly undulate, oblanceolate, rhombic, elliptic, orbicular or reniform, and at base from narrowly cuneate to cordate. The middle and upper cauline leaves likewise vary from linear- or lance-attenuate to deltoid and from entire to pinnatifid; and the heads are either discoid or radiate. *S. Fernaldii*, growing as it does upon a dry exposed limestone tableland without shelter from wind and brilliant light, is a dwarf plant with strong tendency to purple coloring in leaves and involucre, and in all these features, as well as in its disk-flowers, the individuals with crenate-dentate basal leaves seem quite inseparable from Chamisso's original material from the west side of Bering Strait of *S. resedifolius*,

[1] Greenman, Ann. Mo. Bot. Gard. iii. 99 (1916).

[2] Greenman, l. c. 90 (1916).

[3] "but after we had repeatedly made solemn vows to look at nothing else and were finally hastening back across the barren in order to reach the settlement before dark, an unusual appearing Senecio came riding down a mass of sliding gravel to my very feet. This was too great a temptation, so I snatched the plant as it was sliding past." —Fernald, RHODORA, xiii. 131 (1911).

while others are inseparable in foliage, involucre and disk-corollas from material collected by Charles Wright on Arakamtchetchene Island in Bering Straits or by Blaisdell at Cape Nome; while taller and looser-growing individuals are almost identical with Weinmann's specimens from the Kuskokwim Valley in Alaska. The only difference I can make out is that the material from about Bering Sea usually has well developed rays; the Newfoundland plant is usually discoid, though occasionally with short ligules; but the ligules of the Chamisso material are nearly as short as in the radiate plants from Newfoundland, while *S. resedifolius*, var. *columbiensis* Gray is a lax and luxuriant shade-form separated because of its rayless heads. I am, therefore, unable to find any stable characters by which *S. Fernaldii* can be maintained as specifically distinct from *S. resedifolius*.

During the summer of 1923, the party[1] exploring the schistose mountains centering on Mt. Logan in Matane County, Quebec, found a very handsome Senecio with large commonly solitary and radiate heads. This plant (figs. 1^1, 1^2 and 1a), which abounds in turfy chimneys and upon cliffs and talus at altitudes of 850–1150 m. on Mts. Fortin, Logan and Pembroke, and which in its well developed green leaves (basal leaves up to 3 cm. broad, cauline leaves in luxuriant plants up to 8 cm. long and 3.5 cm. broad), tall stature (often 2–3 dm.) and showy elongate ligules, did not suggest in the field the little purplish plant of the dry barrens of western Newfoundland already discussed; but at one station, the dry upper talus and cliffs at the head of Hanging Valley on Mt. Pembroke, plants clearly conspecific with the large-leaved specimens of the moister chimneys had the low stature, reduced foliage and occasionally the discoid heads of the Newfoundland plant. Altogether the plant of the Shickshock Mts. shows almost every conceivable variation, even for so protean a group as *Senecio*, and in this series collected at three closely adjacent stations all the recorded variations of *S. resedifolius* can be matched.

The variation of *S. resedifolius* which was described by Ledebour from the Altai as *Cineraria lyrata* is so much taller and has so much better-developed basal leaves than Chamisso's plant that it has been treated by DeCandolle, Herder and others as a distinct variety, var. *lyratus* (Ledeb.) DC., supposed to be confined to the Altai and Baikal region; but some of the individuals from the Shickshock Mts. are

[1] J. F. Collins, C. W. Dodge, M. L. Fernald, Ludlow Griscom, K. K. Mackenzie, A. S. Pease and L. B. Smith.

scarcely distinguishable from authentic Altai and Baikal material, except in their slightly shorter and broader rays. Others again closely match in their angulate-toothed leaves Tiling's original specimens from Ajan (on the west side of Ochotsk Sea) of var. *multicaulis* Herder; while others have the cauline leaves even more developed than in the type of var. *columbiensis*.

In the Newfoundland plant the unexpanded disk-corollas and the outsides of the lobes are deep orange, in the Shickshock plant usually orange-yellow; but in the latter region a single individual was found with both disk- and ray-flowers decidedly reddish. And, as already noted, in the plants of Newfoundland the heads are commonly discoid but sometimes radiate, while in the Shickshock area they are commonly radiate but occasionally discoid. Exactly the same variations of the heads are found in Siberia, Ledebour explicitly saying in his description: "Capitula majora v. minora, saepissime radiata nec nisi rarissime discoidea. Ligulae plerumque aureae variant flavae et licet rarissime rubicundae."[1] In brief, *Senecio resedifolius*, long supposed to be restricted to the region from Alaska across Siberia, is now known in two extremely isolated regions, the Shickshock Mountains of Gaspé and the Long Range of Newfoundland, where in its numerous modifications it not only parallels but seems to exceed the Alaskan and Siberian plant. Miss Brackett's drawings (fig. 1) show only a few of the variations in eastern America.

SENECIO PAUCIFLORUS AND S. INDECORUS.—Two of the most characteristic species of *Senecio* on the Gaspé Peninsula are strikingly different plants which, in his *Monograph of the North and Central American Species of the Genus Senecio*, are treated by Greenman[2] as a single species, *S. pauciflorus* Pursh. One of the plants, true *S. pauciflorus* (fig. 2), is in eastern Quebec confined to the alpine and subalpine chimneys and meadows of the Shickshock Mts. and to the calcareous terraces bordering the Straits of Belle Isle. North of the Straits of Belle Isle it is characteristic of the mountainous region from Cape Mugford to the northern limits of Labrador, while in western America it extends from near the Arctic Circle in Mackenzie, Yukon and Alaska to the mountains of Wyoming and the Yosemite region of California. In the field *S. pauciflorus* is at once distinguished by its thick and fleshy foliage, the few cauline leaves with blunt teeth

[1] Ledebour, Fl. Ross. ii. 632 (1844–46).
[2] Greenm. Ann. Mo. Bot. Gard. iii. 91 (1916).

and lobes; by its comparatively low stature (1 to rarely 5.5 dm.), few (1–6, more rarely –11) broadly campanulate heads with usually purple involucres, and disk-corollas with orange-red or deep-red lobes.

The other species (fig. 3) is the plant figured and described in Britton & Brown, Illustrated Flora, iii. 479, fig. 4042, as *S. discoideus*.[1] This plant should, however, be called *S. indecorus* Greene, since Hooker's *S. aureus*, δ *discoideus*, upon which *S. discoideus* rests, proves to be *S. pauciflorus*. Unlike *S. pauciflorus*, *S. indecorus* is not an arctic-alpine plant, but it occurs in the Canadian forest at low levels, from Gaspé County, Quebec to the Lake Superior region and at comparatively low altitudes from southern British Columbia to Idaho and northeastern California. In Quebec, where I have been familiar with the two species for twenty years, *S. indecorus* occurs in thickets and woodland-swamps or on talus and cool ledges of limestone; and in the field it is at once distinguished from the alpine and subalpine *S. pauciflorus* by its thin or membranaceous basal leaves sharply lacerate-pinnatifid and rather numerous cauline leaves, tall stature (up to 9 dm.), more numerous (6–40) slenderly cylindric-urceolate heads with green or merely purple-tipped involucres and yellow flowers.

In *S. indecorus* the filiform tube of the corolla is 3.6–6 mm. long, in *S. pauciflorus* only 3–4 mm.; and in the former the slender, strongly costate achenes (fig. 3d) are 2–3 mm. long, the plumper, less prominently ribbed and darker achenes of *S. pauciflorus* (fig. 2d) being 3–3.5 mm. long. When the heads are quite mature the bracts of the involucre of *S. pauciflorus* (fig. 2c) spread or become only slightly reflexed, exposing a smooth and nearly flat denuded receptacle (fig. 2b), but in *S. indecorus* the mature and narrower bracts (fig. 3c) become strictly reflexed and the convex receptacle (fig. 3b) is conspicuously alveolate, the walls of the pits very thin and jagged or almost fimbriate.

Although the heads of *S. indecorus* are normally discoid, they, like those of *S. pauciflorus*, are sometimes radiate and plants of both forms sometimes occur in the same colonies.[2] These radiate individuals

[1] *S. discoideus* Hook. ex Torr. & Gray, Fl. ii. 442 (1843) is usually cited as *S. discoideus* (Hook.) Britton. l. c. (1898), but the combination was actually published and ascribed to Hooker in 1843.

[2] The character, "discoid" or "radiate," is very unsatisfactory in *Senecio*. In the species of northeastern America the ordinarily radiate *S. aureus* L., *S. Robbinsii* Oakes, *S. pauperculus* Michx., *S. obovatus* Muhl. and *S. resedifolius* Less., in addition to those above discussed, are occasionally discoid.

which occur in Quebec side-by-side with the commoner discoid form of *S. indecorus* are quite inseparable from the type from Idaho and other authentic specimens from British Columbia of *S. Burkei* Greenman, Ott. Nat. xxv. 114 (1911) and Ann. Mo. Bot. Gard. ii. 626, t. 20, fig. 1 (1915); and it is significant that many of the British Columbian localities for discoid *S. indecorus* are identical with those cited by Greenman for *S. Burkei*.

In the development of its foliage *S. indecorus* varies as much as *S. pauciflorus*, *S. aureus*, *S. pauperculus* and *S. resedifolius*, the plants showing quick responses to degrees of moisture, exposure and soil-fertility. In different habitats of the same region may be collected specimens with greatly reduced cauline leaves and others with them remarkably dilated. Plants of the latter extreme from Rimouski County, Quebec, are quite inseparable from *S. idahoensis* Rydberg, Bull. Torr. Bot. Cl. xxvii. 183, t. 6, fig. 5 (1900), which Greenman recognizes as a species distinct from *S. pauciflorus*. *S. idahoensis* has all the technical characters of *S. indecorus*,—membranaceous basal leaves, lacerate-pinnatifid cauline ones, tall stature, numerous heads, slender green involucre, characteristic corolla and achene, and the alveolate receptacle—and the type-number is, except for lack of ligules, a good match for the type of *S. Burkei*. None of the characters of disk-corolla, achene and receptacle are mentioned by those who maintain the distinctness of *S. idahoensis;* but the plant is considered remarkable in having the "stem branched from near the base" and "large broad stem-leaves" (Greenman, Ann. Mo. Bot. Gard. iii. 96). The foliage of the type-number, *Sandberg, MacDougal & Heller*, no. 803, is, as already implied, closely matched by that of luxuriant individuals from eastern Quebec and by the type of *S. Burkei;* but, as shown by the sheet of the type-number of *S. idahoensis* in the Gray Herbarium (one of the sheets cited by Greenman), the basal branching of this Idaho specimen is due to the fact that the primary stem had been broken or bitten off, causing the development of few-headed basal branches.

The type of *Senecio discoideus* is Hooker's *S. aureus*, δ *discoideus* from Fort Franklin in Mackenzie. An excellent photograph of Hooker's type is preserved at the Field Museum of Natural History and I am under obligation to Messrs D. C. Davies and J. Francis Macbride for an opportunity to examine it. It is certainly not the plant (*S. indecorus*) which has been passing as *S. discoideus* in eastern

America. In the lobing of its leaves the type of *S. discoideus* is like *S. pauciflorus*, but it has broadly deltoid instead of oblong cauline leaves and much more numerous heads than in the typical *S. pauciflorus* of Labrador and Quebec. Material from British Columbia closely approaches the Fort Franklin plant, however, and *S. discoideus* is best treated as an extreme development of *S. pauciflorus*.

Greene's description of *S. indecorus* at once suggests the plant which has been passing as *S. discoideus* and a beautiful photograph of the type which has been generously furnished me by Professor George W. Albertson of the University of Notre Dame settles beyond question this identity.

Briefly summarized the main characters and the bibliography of *S. pauciflorus* and *S. indecorus* are stated below, and a few characteristic specimens are cited.

S. PAUCIFLORUS Pursh, Fl. Am. Sept. ii. 529 (1814); Greenman, Ann. Mo. Bot. Gard. iii. 91 (1916), in part. *S. aureus*, δ *discoideus* Hook. Fl. Bor. Am. i. 333 (1834). *S. discoideus* Hook. ex Torr. & Gray, Fl. N. A. ii. 442 (1843), as to type but not description. *S. aureus*, γ *borealis* Torr. & Gr. Fl. N. A. l. c. (1843), in part. *S. Lemberti* Greene, Pittonia, iii. 89 (1896). *S. aureus pauciflorus* (Pursh) Britton in Britton & Brown, Ill. Fl. iii. 480 (1898).—Stems rather stout, 1–5.5 dm. high: leaves thick and fleshy; the basal long-petioled, elliptic to reniform, cuneate to cordate at base, coarsely dentate; the median and upper sessile, 2–5 below the inflorescence, lanceolate, oblong or oblanceolate, with mostly obtuse lobes and coarse teeth: heads 1–6, rarely –11, broadly campanulate, usually discoid; involucres usually purple; the blunt to acute bracts 1–2 mm. broad: corollas with filiform tube 3–4 mm. long; the lobes orange-red to deep-red: achenes dark red-brown, plump, 3–3.5 mm. long: mature involucre rotate or oosely reflexed; denuded receptacle smooth and nearly flat.—Calcareous meadows, alpine slopes and wet rocks, northern Labrador to Matane County, Quebec; Mackenzie, Yukon and Alaska to Wyoming and California. The following are in the Gray Herbarium. LABRADOR: hills back of Okkak, *Moravian Brothers*, August, 1911, *F. C. Hinckley;* Hebron, *Moravian Brothers;* Rama, July, 1894, *J. D. Sornborger*, August, 20–24, 1897, *Sornborger*, no. 67; Mugford, August 14, 1900, *Delabarre;* barrens, Forteau, July 30, 1910, *Fernald & Wiegand*, no. 4172; wet mossy spots, limestone and calcareous sandstone terraces, Blanc Sablon, August 2, 1910, *Fernald & Wiegand*, no. 4173. QUEBEC: shore of Seal Lake, Ungava, August 3, 1896, *Spreadborough*, no. 14,387 in part; little swales near summit of limy ridge, Pointe Jones, Brest, Saguenay Co., July 29, 1915, *St. John*, no. 90,779; alpine and subalpine meadows and calcareous walls, altitude 1000–1200 m., Tabletop Mts., Gaspé Co., many collections in August of

1906 and 1923, *Fernald & Collins*, nos. 261, 263, *Fernald, Dodge & Smith*, nos. 26,109, 26,110; wet hornblende-schist at base of Big Chimney, north slope of Mt. Mattaouisse (called on label "Mt. Logan"), Matane Co., July 22, 1922, *Fernald & Pease*, no. 25,341; schistose talus and wet shelves at base (altitude 400–600 m.) of Big Chimney, Mt. Mattaouisse, July 10, 1923, *Dodge, Griscom & Pease*, no. 26,106; moist rocks and turfy chimneys (alt. about 800–1050 m.), Pease Basin, between Mts. Logan and Pembroke, Matane Co, July 13, 1923, *Pease & Smith*, no. 26,107; moist bushy talus and mouths of chimneys at about 900–1125 m. alt., Hanging Valley, Mt. Pembroke, July 16, 1923, *Griscom & Pease*, no. 26,108, August 24, 1923, *Fernald & Smith*, no. 26,111. MACKENZIE: Fort Franklin, *Richardson* (tracing from photograph of *S. aureus* δ *discoideus* Hook.). ALBERTA: Flatts, junction of North Fork and West Branch of Saskatchewan, June 21, 1908, *S. Brown*, no. 1008; Malique Lake, July 8 and 18, 1908, *Brown*, nos. 1173, 1247; Blind Valley and Lakes, alt. 7000–8000 ft., July 6, 1906, *Brown*, no. 414. BRITISH COLUMBIA: below Pipestone summit, July 6, 1904, *J. Macoun*, no. 65,018; upper Spillamacheen Valley, alt 6500 ft., August 3, 1904, *C. H. Shaw*, no. 440; Cornwall Hills, July 28,—*J. McEvoy*, no. 5100; Alberni, Vancouver Island, June 27, 1907, *Rosendahl*, no. 1971. WYOMING: small willows, Middle Ten Sleep Creek, Big Horn Co., August 1, 1901, *Goodding*, no. 465; Little Goose Cañon, Sheridan Co., July 1, 1901, *A. Nelson*, no 2383. IDAHO: Grand Saline (Salt River?), *Burke*. CALIFORNIA: Yosemite region, 1893, *J. B. Lembert* (*S. Lemberti* Greene); Soda Springs, Tuolumne Co., July, 1894, *Lembert* (distributed by Congdon as C 171).

S. INDECORUS Greene, Fl. Francisc. 470 (1897). *S. discoideus* Hook. ex. Torr. & Gr. Fl. N. A. ii. 442 (1843) as to plant described; Britton in Britton & Brown, Ill. Fl. iii. 479, fig. 4042; not *S. aureus* δ *discoideus* Hook. Fl. Bor.-Am. i. 333 (1834). *S. idahoensis* Rydb. Bull. Torr. Bot. Cl. xxvii. 183, t. 6, fig. 5 (1900); Greenman, Monogr. Senecio, I. Teil, 24 (1901), in Engler, Bot. Jahrb. xxxii. 20 (1902), Ann. Mo. Bot. Gard. iii. 96 (1916). *S. Burkei* Greenman, Ott. Nat. xxv. 114 (1911), Ann. Mo. Bot. Gard. ii. 626, t. 20, fig. i. (1915), ibid, iii. 136 (1916).—Slender, 2–9 dm. high: leaves membranaceous; the basal slender-petioled, oblong, elliptic or ovate, cuneate to subcordate at base, sharply or often incisely toothed or sometimes pinnatifid; the middle and upper usually sessile, 4–11 below the inflorescence, **oblong, lanceolate or oblanceolate,** incisely and variously cut into **sharp teeth or** lobes; the uppermost leaves greatly reduced or obsolete; heads 6–40, slenderly cylindric-urceolate (when fresh), discoid or radiate: involucres usually green or merely with purple tips: the acute bracts 0.5–1 mm. broad: filiform tube of corolla 3.6–6 mm. long; lobes yellow: achenes drab or gray-brown, slender, strongly costate, 2–3 mm. long: mature involucre strictly reflexed: denuded receptacle convex, conspicuously alveolate; the walls of the pits very

thin and jagged or almost fimbriate.—Rich thickets, swales and calcareous rock, Gaspé Co., Quebec to the Lake Superior Region; British Columbia to Idaho and northern California. The following are in the Gray Herbarium. QUEBEC: sandy alluvium of Rivière Ste. Anne des Monts, Gaspé Co., August 3–17, 1905, *Collins & Fernald;* clearings and bushy swales along Rivière Ste. Anne des Monts, July 22, 1923, *Fernald, Griscom, Mackenzie & Smith*, no. 26,095; wet calcareous headland by the River St. Lawrence, Grosses Roches, Matane Co., July 17, 1922, *Fernald & Pease*, no. 25,340; openings in Arbor Vitae swamps, Carleton, Bonaventure Co., July 24 and 27, 1904, *Collins, Fernald & Pease;* edge of Arbor Vitae swamp, July 18–21, 1905, *Williams, Collins & Fernald;* dry spruce woods at base of limestone-conglomerate cliffs, Bic, Rimouski Co., July 16, 1904, *Collins & Fernald;* meadows and swamps in slaty region south and east of Bic, July 17, 1907, *Fernald & Collins*, no. 1202 (some heads radiate); dry limestone-conglomerate ledges, south of Bic, July 28, 1907, *Fernald & Collins*, no. 1203; pastures, Rivière du Loup, Temiscouata Co., July, 1913, *Victorin*, no. 40; Roberval, Lake St. John, July 15, 1892, *G. G. Kennedy;* sur les calcaires paléozoiques de l'Ouiatchouan inférieur, Val-Jalbert, Lake St. John, July 22, 1921, *Victorin*, no. 15,436; Spirit Lake (Abitibi), Pontiac Co., July 9, 1918, *Victorin*, no. 8517. MICHIGAN: Champion, July, 1889, *E. J. Hill;* Keweenaw Peninsula, 1863, *Robbins:* Keweenaw Co., July, 1890, *Farwell*, no. 776. BRITISH COLUMBIA: Kicking Horse Valley, alt. 4000 ft., July 15, 1906, *S. Brown*, no. 487a; river-margins, Silver City, August 7, 1885, *J. Macoun;* Griffin Lake, July 6, 1889, *J. Macoun;* Carbonate, altitude 2700 ft., July 7, 1904, *Heacock*, no. 185; Wapta Lake, August 4, 1904, *J. Macoun*, nos. 65,015, 65,020; Skagit Valley, altitude 2500–3000 ft., various dates in July and August, 1905, *J. M. Macoun*, nos. 69,358–65,360; Chilliwack Valley, altitude 3000–4500 ft., various dates, 1901, *J. M. Macoun*, nos. 26,682–26,685; Sophie Mt., altitude 5500 ft., July 17 and 20, 1902, *J. M. Macoun*, nos. 64,990, 64,991; Creston, Kootenay, June 22, 1914, *J. K. Henry*, no. 4; gravel-bed of mountain-stream, Armstrong, July 4,—, *E. Wilson*, no. 247. IDAHO: meadows at Granite Station, Kootenai Co., July 30, 1922, *Sandberg, Mac-Dougal & Heller*, no. 803 (type-number of *S. idahoensis* Rydb.); Forks of St. Mary's River, altitude 1100 m., July 3, 1895, *Leiberg*, no. 1158; Grand Saline (? Salt River, tributary to the Snake), August 16, ——, *J. Burke* (type of *S. Burkei*). WASHINGTON: Big Meadows, Stevens or Spokane Co., August 6, 1902, *Kreager*, no. 428; damp forest, Newman Lake, July 9, 1916, *Suksdorf*, no. 8797; Mt. Constitution, Orcas I., San Juan Islands, August, 1892, *Henderson*, no. 2312, June 25–August 1, 1917, *Zeller*, no. 1252. CALIFORNIA: wet meadows, Pine Creek, Lassen Co., July 9, 1894, *Baker & Nutting* (photograph of TYPE of *S. indecorus*).

Most of the eastern specimens have been distributed as *S. discoideus;* the western as *S. pauciflorus, S. Burkei* and *S. idahoensis.*

EXPLANATION OF PLATE 144.

Fig. 1[1], *Senecio resedifolius* × 1, from Mt. Pembroke, Matane Co., Quebec, *Fernald & Smith*, no. 26,103; 1[2], from Mt. Fortin, Matane Co., Quebec, *Fernald & Smiih*, no. 26, 101; 1[3] and 1[4], from Table Mt., Port à Port Bay, Newfoundland (*S. Fernaldii*), *Fernald & St. John*, no. 10,873; 1a, young plant × 1 from Mt. Fortin, Quebec, *Fernald, Griscom & Mackenzie*, no. 26, 099; 1b, denuded receptacle × 4. Fig. 2, *S. pauciflorus* × 1; 2b, denuded receptacle × 4; 2c, mature involucre × 1; 2d, achene × 4. Fig. 3, upper half of small plant of *S. indecorus* × 1; 3b, denuded receptacle × 4; 3c. mature involucres × 1; 3d, achene × 4.

V. NEW OR RECENTLY RESTUDIED PLANTS OF EASTERN AMERICA.

CAREX HOSTIANA DC., var. **laurentiana** (Fernald & Wiegand) Fernald & Wiegand, n. comb. *C. fulvescens* Mackenzie, Bull. Torr. Bot. Cl. xxxvii. 239 (1910). *C. Hornschuchiana*, var. *laurentiana* Fernald & Wiegand, RHODORA, xiii. 130 (1911).

C. Hostiana DC. Cat. Pl. Hort. Bot. Monsp. 88 (1813) was well described and the plate of *C. fulva* Host, not Goodenough, was cited. Although Kükenthal retains for the species the name *C. Hornschuchiana* Hoppe (1824) he definitely cites the perfectly described *C. Hostiana* (as *C. Hosteana*) as a synonym.

We have again studied the plant of Newfoundland and Anticosti and can find no characters not shown by the European *C. Hostiana*, merely a tendency to slightly larger size of the parts; and several European specimens so closely approach var. *laurentiana* that it might be urged with good reason that the variety is scarcely worthy of separation.

SALIX BEBBIANA Sargent, var. **luxurians** (Fernald), n. comb. *S. rostrata*, var. *luxurians* Fernald, RHODORA, ix. 223 (1907). *S. Bebbiana*, forma *luxurians* (Fernald) Schneider, Journ. Arn. Arb. iii. 75 (1921).

Schneider shows[1] that *Salix rostrata* Thuill. (1797) is not a perfect synonym of *S. repens* L. but that it is identified with two generally recognized varieties of that species and by those who would treat either of these variations as species the name *S. rostrata* Thuill. would have to be used. Under these circumstances the name *S. rostrata* Richardson (1823) for the characteristic American species must give way to *S. Bebbiana* Sargent (1896). Schneider considers var. *luxurians* as "nothing but a forma luxurians," which "should be looked for in other localities of the type." In the vast accumulation of American

[1] Schneider, Journ. Arn. Arb. ii. 68 (1920).

A. E. Brackett del.

FIG. 1, SENECIO RESEDIFOLIUS. FIG. 2, S. PAUCIFLORUS. FIG. 3, S. INDECORUS.

Salix which Schneider studied, however, he saw var. *luxurians* only from the "banks of the St. Lawrence from Rimouski Co. to Gaspé Co.," Quebec. There it is the characteristic extreme of *S. Bebbiana* and on account of its very long capsules (9–12 mm.) and long pedicels (5–8.5 mm.), its plane rather than rugose leaves and its great stature it might almost be considered a species. In *S. Bebbiana* (typical) and *S. Bebbiana,* var. *perrostrata* (Rydb.) Schneider, the mature capsules are usually 5–8 mm. long though in very exceptional specimens they reach 1 cm. and the mature pedicels range from 2–6 mm. in length.

S. Bebbiana var. **capreifolia** (Fernald), n. comb. *S. rostrata,* var. *capreifolia* Fernald, Rhodora, xvi. 177 (1914).

Salix **hebecarpa** (Fernald), n. comb. *S. fuscescens,* var. *hebecarpa* Fernald, Rhodora ix. 224 (1907).

When *S. hebecarpa* was originally published it was taken for an extreme of the Alaskan *S. fuscescens* Anderss. with pubescent capsules and the shrub growing with it but having the capsules glabrous (though the pedicels pubescent) was identified with *S. fuscescens.* Collections made on Mt. Albert in July, 1923 by Messrs. Griscom, Mackenzie, Smith and myself at the type station for *S. fuscescens,* var. *hebecarpa* show that the pubescence of the fruit is by no means constant but in all other characters the Mt. Albert material forms a consistent series; and a second sheet of true Alaskan *S. fuscescens* which has recently come to hand shows that it and the Mt. Albert shrub have quite different leaf-venation, and that the Alaskan shrub has darker scales and smaller capsules. *S. hebecarpa* stands between *S. fuscescens* and *S. pedicellaris* Pursh. From the latter it is separated by its more obovate leaves, the more pubescent and darker scales of the ament, the much shorter, thicker and pubescent pedicels (about equaling to twice as long as the scales), the long nectary and the definite style. The following specimens, all from alpine bogs on Mt. Albert, Gaspé County, Quebec, are representative. The form with glabrous or glabrescent capsule is marked "gl."

August 8–15, 1905, *Fernald & Collins* (gl); July 21, 1906, *Fernald & Collins,* no. 206 (gl), no. 207 (type in Gray Herb.); July 24, 1923, *Fernald, Griscom, Mackenzie & Smith,* no. 25,686 (gl).

Oplopanax horridum (Sm.) Miquel. The Devil's Club is known in our eastern manuals as *Fatsia horrida* (Sm.) B. & H. or as *Echinopanax horridum* (Sm.) Decaisne & Planchon. It seems to be a mono-

typic genus (though the Japanese plant is sometimes separated) clearly distinguished from *Fatsia*, and by the International Rules of Botanical Nomenclature its name should be *Oplopanax horridum* (Sm.) Miquel. *Echinopanax* Decaisne & Planchon, Rev. Hort. Sér. 4, iii. 105 (1854) was started as a genus merely by the statement, "Un autre type très remarquable (*Echinopanax* Nob.) est fourni par le *Panax horridum*." Absolutely no differential character was given by which any one else could tell on what points *Echinopanax* rested as a genus; that highly important detail being left for others to struggle with, they, if successful, giving the credit for the solution to the authors who had not taken sufficient pains themselves to point out the differential characters. The International Rules wisely exclude these names, the authors of which, to use the slang of the day, "pass the buck," stating (Art. 38) that "The mere indication of species as belonging to a new genus or of genera as belonging to a higher group, does not allow us to accept the genus or group in question as characterized and effectively published." The American Rules, however, accept such irresponsible publication and by that code *Echinopanax* is a properly published genus. So far as a prolonged search has revealed, the first satisfactorily published generic name for the Devil's Club is *Oplopanax* Miquel, Ann. Mus. Bot. Lugd.-Batav. i. 16 (1863), which was based upon Torrey & Gray's *Panax* § *Oplopanax*, a section set off by them with a real characterization.

Nelson & Macbride, Bot. Gaz. lxi. 45 (1916), have revived the name *Ricinophyllum* and have made the combination *R. horridum* (Sm.) Nelson & Macbr.; but a moment's examination of the original publication would have shown that *Ricinophyllum* was merely indicated in synonymy as an herbarium-name found on an old sheet of *Panax horridum* Sm. The name *Ricinophyllum*, therefore, has no nomenclatorial status.

HACKELIA DEFLEXA (Willd.) Opiz, var. **americana** (Gray) Fernald & Johnston, n. comb. *Echinospermum deflexum*, var. *americanum* Gray, Proc. Am. Acad. xvii. 224 (1882). *Lappula deflexa*, var. *americana* (Gray) Greene, Pittonia, ii. 183 (1891). *L. americana* Rydb. Bull. Torr. Bot. Cl. xxiv. 294 (1897).

When the genus *Hackelia* was recently taken up[1] the American plant was merged with the European since the character relied upon by Gray in separating it, namely, the presence of a few prickles on

[1] Johnston, Contrib. Gray Herb. n. s. No. lxviii. 43-48 (1923).

the back of the fruit, was found to be very inconstant. Recent examination of the American material, however, shows that it differs from the European in having the leaves elliptic-lanceolate or narrowly ovate and acuminate, the leaves of the European type being spatulate-oblanceolate. In the latter plant the back of the fruit is deltoid-ovate; in the American plant more definitely deltoid. Typical *L. deflexa* extends eastward into China while var. *americana* is present in Amur (*Maximowicz*).

Agoseris **gaspensis**, spec. nov., perennis; foliis lineari-lanceolatis flaccidis integris vel remote pinnato-incisis glabris basi ciliatis; scapo deinde folia superante apice villoso; involucri bracteis lanceolatis attenuatis 1.5–2 cm. longis, exterioribus viridibus apice recurvatis basi valde villoso-ciliatis, ciliis 1–2 mm. longis, bracteis interioribus scariosis valde purpureo-maculatis; floribus aeneis; pappo albo deinde 1.2–1.5 cm. longo, setis minute serrulatis: achenio lineari-fusiformi 7–9 mm. longo glabro, rostro 5–7 mm. longo firmo vix filiformi glabro. —Tabletop Mountains, Gaspé County, Quebec: dry stony subalpine meadows, at 1100–1200 m. altitude, east of Lac Perrée, August 14, 1923, *M. L. Fernald, C. W. Dodge, & L. B. Smith*, no. 26,119; alpine and subalpine meadows and brooksides, northern and northeastern slopes (alt. 950–1300 m.) of Mt. McNab, August 7, 1923, *Fernald, Dodge & Smith*, no. 26,120 (type in Gray Herb.); subalpine meadows on southern slope (alt. about 1200 m.) of Mt. Au Clair, August 10, 1923, *Fernald & Smith*, no. 26,121.

Strongly simulating *Agoseris gracilens* (Gray) Kuntze of the region from southern Alberta and British Columbia to Wyoming, Utah, Nevada and northern California. That species, however, as shown by Gray's original material of *Troximon gracilens*, has the body of the achene only 5–7.5 mm. long and hispid at summit (in *A. gaspensis* 7–9 mm. long and glabrous); the delicate filiform beak 6–8 mm. long (the stouter and firm beak of *A. gaspensis* 5–7 mm. long); and the mature pappus only 8–10 mm. long (in *A. gaspensis* 1.2–1.5 cm. long). Furthermore, in *A. gracilens* the disk at the tip of the beak is about 0.5 mm. in diameter, in *A. gaspensis* nearly twice as broad.

A. gaspensis is of peculiar interest because it is the first member of this predominantly cordilleran genus to be found in the Shickshock Mountains, a region in which the cordilleran relationship is very pronounced and already well known through such plants as *Polystichum mohrioides*, var. *scopulinum* (D. C. Eaton) Fernald (discussed on p. 89), *Salix brachycarpa* Nutt., *Dryas Drummondii* Richardson, *Lonicera involucrata* (Richardson) Banks, and hundreds of others.

The genus which was long called in America and which is maintained by Dalla-Torre & Harms as *Troximon* Nutt. should be known as *Agoseris* Raf. The question was cleared by Greene in 1891,[1] but more recently Hall,[2] who has been followed by other western botanists has urged the retention of *Troximon* in the following words.

"The reinstatement of the genus Agoseris Raf. (1817) has been proposed for those species of Troximon in which the achenes are beaked. But the two groups are best received into one genus, being connected by the thick-beaked *T. glaucum*. Troximon was first used as a generic name by Gaertner (1791) but since his genus is not sustained, we may properly write Troximon Nutt. (1813) as the name of the present group."

In Hall's argument several fundamental facts seem to have been overlooked. In 1791 Gaertner[3] published *Troximon* as a genus based upon three Linnean species of *Tragopogon*, *Trag. Dandelion*, *T. virginicum* and *T. lanatum*. The three species were, according to *Index Kewensis*, formally named *Troximon Dandelion*, *T. virginicum* and *T. lanatum* by F. W. Schmidt in 1795 and they were certainly described under these binomials by Persoon in 1807. The first two are species of *Krigia* Schreber (1791), belonging to the subgenus *Cynthia* (D. Don) Gray, which is often maintained as a distinct genus *Cynthia* D. Don (1829).[4] The third species, *Trox. lanatum*, is generally referred to *Scorzonera* L. (1753). By whichever principle we reason, whether we typify *Troximon* Gaertn. by its first species, by the greater number of species or by the exclusion from it of the species (*T. lanatum*) which belongs to the earlier-published *Scorzonera*, we arrive at the same conclusion, that

TROXIMON Gaertn. (1791) = CYNTHIA D. Don (1829) and should be used by those who maintain *Cynthia* as generically distinct from *Krigia* Schreb. (1791). Whether *Krigia* (1791) has priority over *Troximon* (1791) I have as yet been unable to determine.

Hall, apparently considering Troximon Gaertner as a "genus . . . not sustained" would retain "Troximon Nutt. (1813)." But what was *Troximon* Nutt. (1813)? The reference ordinarily given is to Nutt. in Fraser's Cat. nos. 83 and 84. Fraser's *Catalogue*

[1] Greene, Pittonia, ii. 176 (1891).
[2] Hall, Univ. Cal. Pub. Bot. iii. No. 1: 276 (1907).
[3] Gaertn. Fruct. ii. 360 (1791).
[4] D. Don, Edinb. New Phil. Journ. vi. 309 (1829).

was merely a list of names and the complete treatment under nos. 83 and 84 was as follows:

"83* Troximon ciliatum. ‡ M.

84* ————————glaucum. ‡ M."

This certainly does not constitute satisfactory publication of a genus. The next reference commonly given is to Pursh, Fl. Am. Sept. ii. 505 (1814). But Pursh gave absolutely no generic diagnosis and ascribed the genus without question to Gaertner and to Persoon. That Pursh had no thought of setting up a new genus is perfectly evident from the fact that he has two species, *T. glaucum* which is an Agoseris, and *T. virginicum* which was one of the original species of *Troximon* Gaertn. Nor did Nuttall in his Genera, ii. 127 (1818) indicate any intent to set off a new genus *Troximon* as distinct from Gaertner's genus; for he ascribed *Troximon* directly to Gaertner and he so far accepted Gaertner's definition as to include the oriental *T. lanatum* which belongs to the genus *Scorzonera*.

In 1817 Rafinesque properly published *Agoseris*[1] and again, in 1819,[2] he gave a good characterization of the genus. There is no question, then, that AGOSERIS Raf. (1817) is the correct name for the genus which still passes erroneously as *Troximon* "Nutt.," and that TROXIMON Gaertn. (1791) is the correct name for *Cynthia* D. Don (1829).

[1] Raf. Fl. Ludov. 58 (1817).

[2] Raf. Journ. de Phys. lxxxix. 100 (1819).

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I. RECORDS PRELIMINARY TO A GENERAL TREATMENT OF THE EUPATORIEAE,—IV.

By B. L. Robinson.

Since publishing about a year ago the preceding installment of similar records, the writer has had opportunity to examine several extensive series of specimens throwing further light upon the classification of the *Eupatorium* tribe. The chief sources of this material have been as follows: 1) A third loan of more than a hundred specimens from the Museum of Natural History in Paris, including a few additional plants of the very interesting Brazilian collection of Auguste de Saint-Hilaire and an admirable suite of Triana plants from Colombia, the latter being unusual from the fact that they bear the original detailed geographic and ecological data of collection. 2) The later gatherings of Dr. H. A. Gleason and Mr. J. S. De La Cruz in British Guiana. 3) The *Compositae-Eupatoriae* secured on the second expedition of the Field Museum of Natural History for the botanical exploration of Peru. These plants collected by Mr. J. Francis Macbride had the same high excellence as those of the preceding expedition and included many novelties of unusual interest. 4) The *Compositae-Eupatoriae* of Prof. Hitchcock's expedition to Ecuador, admirably supplementing the earlier collecting of Dr. J. N. Rose and including material from some regions, such as the valley of the Pastaza River to the east of Mt. Chimborazo, scarcely if at all explored previously and yielding noteworthy novelties. 5) Miscellaneous *Eupatoriae* referred to the writer by the United States National Herbarium from Panama, Costa Rica (collections of Dr. W. R. Maxon and assistants), and Honduras (collection of Mr. M. A. Carleton); by the New York Botanical Garden from the West Indies; by the Missouri Botanical Garden from Panama and Central America (collections of Dr. J. M. and Mr. M. T. Greenman). 6) Previously unstudied portions of large loans from the Royal Gardens of Kew and from the University of Geneva. 7) A considerable series of excellent photographs obtained by purchase from the Botanical Museum at Berlin and showing the precise identity of many species hitherto imperfectly known in America.

Such new data as have been obtained from these sources relative to the further classification of the *Eupatoriae* may be put on record as follows:

Ophryosporus (§ **Ophryochaeta**) **apricus**, spec. nov., suffrutescens inclinatus gracilis supra patenter ramosus; caulibus teretibus ca. 3

mm. crassis dense pubescentibus pallide brunneis; internodiis 6–12 cm. longis; ramis curvatis; foliis oppositis ovatis vel ovato-oblongis acuminatis basi rotundatis vel subacutatis basin versus integris aliter serratis (dentibus usque ad 1 mm. altis et 4 mm. basi latis) supra parce puberulis subtus paullo pallidioribus breviter praecipue in nervis brunneo-pubescentibus supra basin pinnatim 5–7-nervatis inter nervos delicate reticulatis 3.5–4.5 cm. longis 1.8–2.8 cm. latis membranaceis; petiolo ca. 8 mm. longo dense brunneo-pubescenti; paniculis terminalibus et lateralibus patenter ramosis et laxiusculis foliaceo-bracteatis 1–1.5 dm. longis 6–12 cm. diametro saepe ad apicem caulis in inflorescentiam magnam laxam compositam conjunctis; capitulis ca. 7-floris breviter pedicillatis ca. 4.5 mm. altis et 3.5 mm. diametro; involucri squamis ca. 7 longitudine subaequalibus oblongis apice rotundatis ciliolatis dorso glabris vel subglabris ca. 3 mm. longis et 1 mm. latis, intimis 1–2 angustioribus oblanceolatis; corollis albis ca. 3 mm. longis; tubo proprio 1.5 mm. longo glandulari-puberulo; faucibus paullo ampliatis ca. 1 mm. longis; dentibus limbi 5 deltoideis patentibus 0.5 mm. longis; achaeniis immaturis glabris ca. 1.3 mm. longis; pappi setis ca. 25 vix scabratis corolla paullo brevioribus. —PERU: sprawling in sunny montaña, about 1830 m. alt., July 17–26, 1923, *J. F. Macbride*, no. 5204 (TYPE, Field Mus.; ISOTYPE, Gr.). This species most nearly approaches the Ecuadorian *O. Sodiroi* Hieron. but has much more sharply and deeply toothed leaves, narrower and oblong rather than obovate involucral scales, and much smaller stigmas.

O. (§ **Ophryochaeta**) **Macbridei**, spec. nov., fruticosus gracilis ca. 1.5 m. altus oppositirameus; caulibus teretibus juventate crispe puberulis mox glabratis ca. 3 mm. crassis medullosis; medulla alba; internodiis 4–9 cm. longis; foliis oppositis breviter petiolatis oblongis longe acuminatis basi acutis supra mediam partem utroque obscure 3–4-serrato-dentatis (dentibus 0.5 mm. altis et 4 mm. inter se distantibus) vel subintegris plerisque deflexis 5–6 cm. longis 1.5–2 cm. latis utrinque praecipue in costa nervisque paullo hirtellis supra basin 3-nervatis in aetate bullescentibus et subcoriaceis subtus vix pallidioribus; petiolo 3–5 mm. longo; paniculis et axillaribus et terminalibus foliaceo-bracteatis compositis sordide villosulis; capitulis breviter pedicellatis 5–7-floris in corymbis convexis subdensis gestis ca. 5.5 mm. altis; bracteolis lanceolatis vel spatulato-oblanceolatis vel linearibus 1–3 mm. longis; pedicellis 1–1.5 mm. longis; involucri squamis ca. 6 oblongis ciliolatis dorsaliter subglabris ca. 3.5 mm. longis et 1 mm. latis apice rotundatis, extimis 4 basin versus cum nervis 2 calloso-incrassatis munitis; corollis tubulatis ca. 2.5 mm.

longis sine faucibus distinctis; dentibus limbi patentibus ca. 0.7 mm. longis; styli ramis leviter clavatis; achaeniis ca. 1.5 mm. longis glabris; pappi setis ca. 20 corollam subaequantibus albidis vix scabratis. —PERU: slender shrub of sunny thicket-edges, Yanano, alt. about 1830 m., May 13–16, 1923; *J. F. Macbride*, no. 3717 (TYPE, Field Mus.; ISOTYPE, Gr.). Falling into the group with the Bolivian *O. Cumingii* (Sch.-Bip.) Benth. and *O. Kuntzei* Hieron., this species is readily distinguished from both by its much larger and more open inflorescence and its subentire leaves of firmer texture.

Eupatorium (§ **Hebeclinium**) **beneolens**, spec. nov., suffruticosum vel fruticosum 1–3 m. altum regulariter patenterque ramosum; caule tereti 7 mm. vel ultra crassitudine medulloso; medulla alba; indumento pallide brunneo copioso et patenter lanato-velutino vel breviori et subappresso-sericeo; internodiis 5–9 cm. vel ultra longitudine; ramis curvato-adscendentibus; foliis oblongis vel rhombeo-ovatis gradatim acuminatis basi acuta et apice exceptis serratis (dentibus 0.3–2 mm. altis 3–5 mm. basi latis apice callosis) firmiter membranaceis supra viridibus inconspicue villosis subtus pallidioribus subsericeo-pubescentibus pinnativeniis 12–17 cm. longis 5–7.5 cm. latis; costa media densissime sericeo-velutina in facie inferiori exserta, venis lateralibus numerosis utroque ca. 12–19 prorsus curvatis; petiolo 1–3 cm. longo; panicula terminali pyramidali 13–19 cm. alta 17–27 cm. diametro oppositiramea; bracteolis linearibus; capitulis sessilibus ca. 6 mm. altis et 3.5–4.5 mm. diametro ca. 17-floris; involucri subcampanulati squamis ca. 20 ut dicitur roseis sed post exsiccationem brunnescentibus margine pallidis conspicue ciliatis subuninerviis apice subacutis vel rotundatis 3–4-seriatim imbricatis, extimis ovatis multo brevioribus, intermediis oblongo-linearibus, intimis linearibus plerisque acutis in sicco patenter recurvantibus; disco convexo hispido-villoso; flosculis ut dicitur fragrantibus; corollis albis glabris ca. 4 mm. longis; tubo proprio 2.5 mm. longo; faucibus cylindratis 1.5 mm. longis vix ampliatis; dentibus limbi deltoideis patentibus 0.5 mm. longis; antheris subliberis apice conspicue appendiculatis; achaeniis ca. 1.3 mm. longis glabris stramineis vel tardius nigrescentibus cum costis pallidis; pappi setis ca. 30 albis corollam subaequantibus.—PERU: a liana-like shrub with whitish flowers, Muña, trail to Tambo de Vaca, June 27, 1923, alt. about 2440 m., *J. F. Macbride*, no. 4912 (TYPE, Field Mus.; ISOTYPE, Gr.); a straggling shrub 3 m. high with fragrant greenish-white flowers, at same place and altitude, June 5–7, 1923, *J. F. Macbride*, no. 4270 (Field Mus., Gr.).

This species from its hairy receptacle is clearly of § *Hebeclinium* and differs much both in habit and technical features from *E. ne-*

morosum Klatt and *E. macrophyllum* L., the only other species of this section thus far known from Peru.

In *E. bencolens* two marked pubescence-forms are to be noted in the admirable series of specimens secured by Mr. Macbride, namely:

Forma **typicum**, caule densissime patenterque velutino-tomentoso sublanato.—Distrib. and exsicc. as above.

Forma **ctenotum**, forma nova, caule subsericeo-pubescenti, indumento denso quam apud formam typicam breviori et quasi pectinato subappresso.—PERU: sunny brush-lands, a half shrub 1–3 m. high, uniformly branching; inflorescences terminal; involucral scales pink; fls. white, very fragrant, Muña, trail to Tambo de Vaca, about 2440 m. alt., June 27, 1923, *J. F. Macbride*, no. 4917 (TYPE, Field Mus.; ISOTYPE, Gr.); also slender-stemmed open-branched shrub about 3 m. high at edge of a bamboo thicket, alt. about 1982 m., Huacachi, near Muña, 20 May to 1 June, 1923, *J. F. Macbride*, no. 4085 (Field Mus., Gr.).

E. (§ **Conoclinium**) **bullatissimum**, spec., nov., herbaceum perenne fortasse frutescens (basi ignota); caule tereti flexuoso incurvo-puberulo 5 mm. diametro albo-medulloso; foliis oppositis petiolatis ovatis acuminatis basi rotundatis plus minusve crenatis valde supra basin pinnatim 5-nervatis grosse reticulato-venosis utrinque in nervis et venis principibus puberulis supra atroviridibus valde rugosis subtus laete viridibus cum venis valde exsertis reticulatis (areolis plerisque 1–3 mm. diametro) textura membraceis 8–13 cm. longis 4.7–6 cm. latis; petiolo puberulo tereti ca. 12 mm. longo; appendicibus stipuliformibus nullis; panicula terminali basi foliaceo-bracteata divaricatim oppositiramea ovoidea ca. 2 dm. longa et crassa fulvido-tomentella; capitulis ca. 22-floris sessilibus ad apices ramorum subglomeratis ca. 5 mm. longis; involucri campanulati squamis regulariter gradatis ca. 35 ovatis apice rotundatis dorso viridibus glabris 2–3-striatis margine ciliolatis; receptaculo subhemisphaerico glabro; corollis graciliter tubulatis ca. 3 mm. longis ut videtur atropurpureis saltim post exsiccationem fuscescentibus sine faucibus distinctis; limbi dentibus brevibus plus minusve puberulis; achaeniis nigris crassiusculis ca. 1.3 mm. longis lucidulis in angulis paullo scabratis; pappi setis ca. 30 albis barbellatis corollas subaequantibus.—ECUADOR: Province Tungurahua: edge of woods, Valley of Pastaza River between Baños and Cashurco, 8 hours east of Baños, alt. 1300–1800 m., Sept. 25, 1923, *Prof. A. S. Hitchcock*, no. 21,814 (TYPE, Gr.). This species on account of its much elevated indeed nearly hemispherical receptacle falls technically in the § *Conoclinium*, and is of course very different from either of the two Ecuadorian species heretofore known

to belong to this section, namely, *E. lamiifolium* HBK. and *E. Turczaninowii* Robinson both of which have leaves which are densely gray- or white-tomentose beneath, longer petioles and many other differences. *E. bullatissimum* in many respects resembles the still obscure *E. smilacinum* HBK. of Colombia, but that is said to have angulate branches, much smaller leaves hispid beneath and provided with a petiole about a quarter as long as the blade.

E. (§ **Cylindrocephala**) **caldense**, spec. nov., arboreum oppositirameum; ramis primo distincte sexangularibus deinde subteretibus post exsiccationem multicostulatis purpureo-olivaceis villosulis et minute granuliferis; pilis patentibus delicatulis articulatis; internodiis 6 cm. vel ultra longis; foliis oblongis acuminatis integris basi subacutis breviter petiolatis supra basin 3-nervatis supra primo inconspicue pubentibus tardius glabratis et subbullatis subtus vix pallidioribus persistenter pubescentibus crassiuscule membranaceis 5–9 cm. longis 17–32 mm. latis; petiolo 4–7 mm. longo fulvido-tomentello; corymbis terminalibus valde convexis ca. 1 dm. diametro; capitulis ca. 12-floris sessilibus ad apices ramulorum plerumque trinis vel quinis ca. 12 mm. longis 5–6 mm. diametro; involucri cylindrati squamis ca. 21 regulariter ca. 5-seriatim gradatis arcte adpressis apice obtusissimis vel rotundatis conspicuiter ciliatis dorso subherbaceis 3-nervatis, extimis suborbicularibus ca. 2.2 mm. longis et 1.7 mm. latis, intermediis oblongis ca. 7 mm. longis et 2 mm. latis, intimis oblanceolato-linearibus subacutis ca. 9 mm. longis et 0.8 mm. latis; corollis roseo-albis glabris tubulatis ca. 5 mm. longis gradatim sursum ampliatis sine faucibus distinctis; dentibus limbi 0.7–0.9 mm. longis; antheris apice bene appiculatis; achaeniis valde immaturis gracilibus deorsum attenuatis angulis minute scabratis ca. 4 mm. longis; pappi setis ca. 30 albidis 4–5 mm. longis.—COLOMBIA: tree on bushy flat, alt. 1400–1600 m., on Rio Quindio above Armenia, Dept. Caldas, in the Cordillera Central, July 25, 1922, *Pennell, Killip & Hazen*, no. 8736 (TYPE, Gr.). This species approaches in many of its characters *E. punctulatum* DC., which, however, has a flatter-topped more fastigiately branched inflorescence, somewhat fewer-flowered heads, and distinctly toothed cauline leaves, longer petioles, and nearly smooth stem. While these differences are not individually strong they are in combination sufficient to make it very unlikely that the present plant of the Central Cordillera can represent the species of Eastern Brazil.

E. (§ **Eximbricata**) **Carletonii**, spec. nov., herbaceum verisimiliter perenne (basi ignota) decumbens 1.5–2 dm. altum obscure adpresseque puberulum aspectu glabrum adscendenter ramosum; caulibus subhexagonis purpureis vix 2 mm. crassis; foliis oppositis petiolatis pal-

matim 3-fidis 3.5-6 cm. longis (petiolo anguste alato 1–2 cm. longo incluso); lobis bifidis vel trifidis vel pinnatim dissectis; rhachibus et segmentis linearibus 1–1.5 mm. latis; lobis ultimis apice obtusis; inflorescentiis terminalibus fastigiatim ramosis irregulariter cymosis planiusculis 3–6 cm. diametro; pedicellis 2–7 mm. longis capillaribus; capitulis ca. 4–5 mm. altis et 4 mm. diametro ca. 20-floris; involucri campanulati squamis anguste lanceolatis acutis viridibus subaequalibus laxe imbricatis plerisque 2-costulatis ca. 3 mm. longis et 0.5 mm. latis minute puberis, extimis 2–4 multo minoribus; corollis laete roseis ca. 2.5 mm. longis glabris; tubo proprio ca. 0.9 mm. longo; faucibus cylindratis vix ampliatis ca. 1.3 mm. longis; dentibus limbi ca. 0.3 mm. longis; achaeniis nigrescentibus 1.2 mm. longis deorsum decrescentibus subglabris; pappi setis 13–15 delicatule capillaribus albis 1.5–2 mm. longis.—HONDURAS: on rocks, Cuyamel, March 30, 1923, *M. A. Carleton*, no. 466 (TYPE, Gr.). This highly interesting species was among plants recently sent from the United States National Herbarium for examination at the Gray Herbarium. It is well marked by its deeply cleft linear-lobed leaves which give it a habit very unlike that of any other Central American species of the genus.

E. (§ **Subimbricata-Cylindrocephala**) **Taunayanum** Glaziou, Bull. Soc. Bot. Fr. lvi. Mém. 3, 384 (1909), where listed as a probable novelty but without diagnosis. So far as known to the writer this species has never been described. Its characters, drawn from an isotype (Glaziou's no. 11,002 of the Royal Herbarium at Kew) and manifestly identical material in the Gray Herbarium, are as follows: fruticosum subglabrum; caulibus teretibus post exsiccationem longitudinaliter rugosis 3–6 mm. vel ultra diametro firmiter lignosis per abortionem axis principis saepe quasi dichotomis; ramis curvato-adscendentibus brunneis vel purpureis foliosis vel in parte proximali ob delapsu foliorum nudatis cicatrosis; foliis oppositis breviter sed distincte petiolatis lanceolatis acuminatis basi acuta excepta argute serratis 5–8 cm. longis 12–25 mm. latis supra basin pinnatim 5(–7)-nervatis supra glaberrimis impresse reticulatis subtus pallidioribus in axillis nervorum arachnoideo-lanatis aliter glabris; petiolo 5–8 mm. longo purpureo; internodiis 6–13 mm longis; corymbis densis valde convexis 6–8 cm. diametro; capitulis numerosissimis sessilibus vel subsessilibus saepe binis vel ternis maturitate ca. 1 cm. longis (stylis exceptis) 4–5-floris; involucri cylindrati ca. 7 mm. longi squamis ca. 12 brunnescenti-stramineis 3–4-seriatim laxe imbricatis caducis dorso glabris 2–3-nervatis obtusis vel apice rotundatis ciliolatis, extimis ovatis ca. 2 mm. longis et 0.8 mm. latis, intermediis oblongis ca. 4–5

mm. longis et 1.3 mm. latis, intimis lineari-oblongis ca. 6 mm. longis et 1.2 mm. latis; corollis roseis vel albis graciliter tubulosis ca. 5 mm. longis glabris; achaeniis nigris gracilibus ca. 3 mm. longis deorsum decrescentibus; pappi setis ca. 32 flavescenti-albis barbellatis basin versus paullulo incrassatis.—BRAZIL: in forest of Tijuca near Corcatimba, Rio de Janeiro, *Glaziou*, no. 11,002 (ISOTYPE K., Copenhagen, fragm. Gr.); summit of Tijuca, *E. W. D. & M. M. Holway*, no. 1426 (Gr.); Brazil without locality, *Glaziou*, no. 536 (Gr., from herb. of Klatt).

This species somewhat recalls the following, from all of which it can be readily distinguished: *E. roseum* Gardner which has shorter much blunter and clearly pinnate-veined not pinnately nerved leaves. *E. itatiayense* Hieron. which has much longer internodes, strongly angled stems, greenish-stramineous involucre and 3(not 5–7)-nerved leaves. *Symphyopappus polystachyus* (DC.) Baker which has at least part of its heads much more clearly pedicelled, its involucral scales broader and more stramineous, its achenes shorter and thicker, and its leaves of firmer texture.

E. (§ **Subimbricata**) **desmophyllum**, spec. nov., fruticulosum ca. 3 dm. altum griseo-puberulum vel -tomentellum habitu lavandulaceum erectum a basi decumbenti adscendenter oppositirameum; caule tereti fusco-griseo ad 3 mm. diametro; internodiis 5–12 mm. longis; ramis gracilibus a basi et praecipue in media parte foliosis superne subnudis; foliis oppositis dense fasciculatis linearibus integerrimis sessilibus subacutis margine valde revolutis uninerviis utrinque canescenti-tomentellis 7–15 mm. longis 0.8–1.2 mm. latis; corymbis terminalibus plerisque 3–5-capitulatis ca. 3 cm. diametro; capitulis ca. 18-floris ca. 12 mm. altis 6–8 mm. diametro; involucri turbinato-campanulati squamis ca. 24 pluriseriatim imbricatis scariosis brunnescentibus 5–7-striato-costulatis ciliatis apice rotundatis dorso parce griseo-puberulis vel glabriusculis, extimis brevissimis orbiculari-ovatis, intermediis late oblongis, 4 mm. longis 2 mm. latis, intimis oblongo-linearibus; receptaculo plano glabro; corollis ut videtur albis vel albidis tubulatis 6.5 mm. longis glabris gracilibus sine faucibus distinctis, dentibus limbi lanceolato-oblongis ca. 0.6 mm. longis; achaeniis nigrescentibus minute scabratis ca. 3.2 mm. longis basi callosis; pappi setis ca. 30 corollam subaequantibus flavescenti-albis. —PERU: dry banks above the Rio Marañon, Chavanillo, alt. about 2440 m., Aug. 17–26, 1922, *Macbride & Featherstone*, no. 1975 (TYPE, Field Mus.; ISOTYPE, Gr.). A species of marked habit (suggesting a labiate rather than a composite), obviously related to *E. lavandulaefolium* DC. but differing in its larger more numerously flowered heads,

broader multistriate involucral scales of firmer texture and brownish color, smaller leaves, etc.

E. (§ **Conoclinium**) **dichroum**, spec. nov., ut videtur herbaceum et perenne 5 dm. vel ultra altitudine (basi ignota); caule erecto opposi-tirameo paullo flexuoso post exsiccationem costulato pallide brunneo araneoso-subtomentello; ramis gracilibus adscendentibus foliosis; foliis oppositis rhombeo-ovatis utroque acutis basin cuneatam versus integerrimis aliter inciso- vel crenato-dentatis conspicuiter bicoloribus supra viridibus paullo arrachnoideo-puberulis subtus dense griseo-lanulatis membranaceis 2.8–4.2 cm. longis 1.2–2.4 cm. latis multo supra basin subtrinervatis; petiolo gracili griseo-puberulo 8–12 mm. longo; inflorescentiis terminalibus densis primo subglobosis 1–2 cm. diametro maturitate irregulariter subcorymbosis ca. 4 cm. diametro; pedicellis 2–3 mm. longis; capitulis ca. 20-floris 8 mm. altis 4 mm. diametro; disco subconico; involucri squamis ca. 20 subtriseriatis argute acuminatis leviter striato-costulatis dorso pubescentibus, ex-timis lanceolatis, interioribus anguste oblongo-lanceolatis; corollis gracilibus; tubo proprio 2 mm. longo; faucibus paullo ampliatis ca. 1.2 mm. longis, dentibus limbi angustis recurvatis extus minute hispidulis; achaeniis 2.2 mm. longis 0.6 mm. crassis atrobrunneis glabris basi calcaratis; pappi setis ca. 32 flavescenti-albidis tenuibus acutis barbellatis.—COLOMBIA: Andes of Bogotá at El Boqueron, alt. 2700 m., October 20, 1852, *J. Triana*, no. 1239 (TYPE, Par., phot. and small fragm. Gr.).

This species in pressed specimen singularly recalls in habit and its gray and green coloration *Verbesina encelioides* though its leaves are much smaller. It is somewhat intermediate between *E. ballotaefolium* HBK. and *E. lanulatum* Robinson. From the former it may readily be distinguished by its cuneate-based and more incisely toothed leaves of rhombic-ovate outline. From the latter it differs in having much larger, thinner, more incisely toothed and somewhat triplinerved leaves. In *E. lanulatum* the throat of the corolla was found to exceed the proper tube while in *E. dichroum* the reverse is the case. In this group and probably from the same region is the slightly known *E. parvulum* HBK. which, however, has leaves truncate at base.

E. DIPLODICTYON Robinson, Proc. Am. Acad. liv. 325 (1918). This species was founded upon a specimen collected in Colombia by Lobb and now in the Kew Herbarium. This was unhappily unaccompanied by more precise locality. It is therefore of interest to recognize in Dr. Pennell's recent collection a specimen which can be confidently identified with this species and therefore establishes its geographic position. Dr. Pennell's label bears the following data: climbing herb

on rocky stream-bank in forest, Cordillera Occidental below Cerro Tatama, Rio San Rafael, Department of Caldas, alt. 2500–2800 m., Sept. 7–11, 1922. This new material, agreeing with that of Lobb in all important respects, differs in having leaves papillo-scabrid and dull above rather than subglabrous and shining. It is probable that these differences are merely individual and perhaps due to the stage of development, the plant of Pennell being still in bud, that of Lobb being fully mature. Re-examination of the species suggests that it is rather closely related to though distinct from the Ecuadorian *E. lamiifolium* HBK. and *E. Turczaninowii* Robinson and would better be referred to § *Conoclinium* rather than § *Campuloclinium*.

E. (§ **Subimbricata**) **eximium**, spec. nov., fruticosum carnosum, in inflorescentia obscure strigilloso-puberulum, aliter glaberrimum; caulibus pluribus 1–2 m. longis teretibus molliter lignosis medullosis ad inflorescentiam terminalem foliosis; internodiis 1–2 cm. longis; foliis oppositis petiolatis oblongis acuminatis basi abruptius acutatis paullo undulatis vel integerrimis margine anguste revolutis carnoso-coriaceis ca. 5–6 cm. longis et 2–3 cm. latis utrinque glaberrimis subtus vix pallidioribus; costa magna conspicui, venis lateralibus paucis pinnatis supra obscuris subtus saepius omnino invisibilibus; petiolo crasso 1–1.2 cm. longo; panicula laxe corymbosa valde convexa transverse ellipsoidea ca. 1.5 dm. alta et 2.5 dm. diametro; pedicellis 9–14 mm. longis gracilibus cum bracteolis parvis filiformibus 1–3 munitis; capitulis numerosis sed nunquam congestis ca. 9-floris 8.5 mm. altis 6 mm. diametro; involucri subcylindrati squamis ca. 10 inaequalibus subtriseriatis, exterioribus lanceolatis acutiusculis, interioribus oblongis ciliolatis apice rotundatis ca. 4 mm. longis et 1.3 mm. latis; corollis anguste infundibuliformibus laete lilaceo-roseis glabris 5 mm. longis; tubo proprio 1 mm. longo; faucibus gradatim ampliatis 3 mm. longis; dentibus limbi 5, lanceolato-deltoideis 1 mm. longis; achaeniis (immaturis) glabris 1.5–2.2 mm. longis; pappi setis ca. 40 albis ca. 4.5 mm. longis.—Costa Rica: vicinity of La Palma, on the road to La Hondura, alt. 1500–1700 m., July 17, 18, 1923, *W. R. Maxon & A. D. Harvey*, no. 7941 (type, Gr., U. S.). "Growing in a bushy mass spreading 1–2 m. in all directions from a large stump."

This exceedingly handsome species is most closely related to the Colombian *E. sciaphilum* Robinson, which however differs in having subsessile much more obtuse leaves and somewhat larger heads, flowers, and achenes. *E. eximium* differs from *E. araliaefolium* Less. in having smaller leaves, fewer-flowered heads, much less unequal involucral scales and much shorter proper tube of the corolla.

Other fleshy species with which *E. eximium* might possibly be confused are *E. parasiticum* Klatt, which has fewer-flowered heads, more ovate leaves, and a scarcely imbricated involucre; *E. arthrodes* Robinson and *E. carnosum* Kuntze, both of which have broad and obtuse outer involucral scales as well as many minor differences in foliage, etc.

E. eximium must be an extraordinarily beautiful object when in full bloom and would seem worthy of horticultural attention.

E. GRANDE Sch.-Bip. ex Bak. in Mart. Fl. Bras. vi. pt. 2, 347 (1876). To the synonymy of this species may be added with fair confidence *E. angulosum* Glaziou, Bull. Soc. Bot. Fr. lvi. Mém. 3, 390 (1909). Glaziou's species, merely listed as a doubtful novelty and never given a published diagnosis, was founded upon Glaziou's no. 21,578, which, to judge from an isotype in the herbarium of the Royal Gardens at Kew, is merely very young material of *E. grande*, with the inflorescence as yet too immature to show its long pedicels and openly branched nature which at a later stage become characteristic of the species. In all other respects, so far as the stage of development permits comparison, the correspondence is perfect.

E. (§ **Eximbricata**) **hidrodes**, spec. nov., suffruticosum oppositirameum ad 12 dm. altum (Wright) vel fruticosum 2–3 m. altum (Leon); ramis teretibus post exsiccationem leviter striato-costulatis; ramulis gracilibus a pilis tenuibus moniliformibus atropurpureis indutis; foliis oppositis petiolatis ovatis vel ovato-lanceolatis plerisque subintegris apice subcaudato-attenuatis basi acutis supra glabris vel glabriusculis subtus vix pallidioribus praecipue in nervis hirtellis membranaceis vel aetate subchartaceis paullo supra basin pinnatim 3(–5)-nervatis 6–12 cm. longis 2.4–6 cm. latis; petiolo 1.3–2 cm. longo purpureo-villosulo; panicula terminali corymbiformi basi foliaceo-bracteata patenter ramosa purpureo-pubescenti; pedicellis subfiliformibus ad 1 cm. longis bracteolas 1–3 minimas gerentibus; capitulis ca. 20-floris 6 mm. altis; squamis involucri ca. 12 linearibus 1–2-nervatis acutiusculis vel apice vero subobtusis vel etiam rotundatis vix imbricatis dorso puberulis et cum glandulis globularibus lucidulis instructis; corollis primo purpureis deinde viridescentibus; achaeniis 2.7 mm. longis maturitate atrobrunneis cum glandulis globularibus sessilibus ornatis deorsum decrescentibus apice cum basi styli persistenti paullo incrassata nigra (verisimiliter nectarifera) coronatis; pappi setis corollam subaequantibus saepe purpurascentibus.—*E. celtidifolium*, var. *quintuplinerve* Griseb. Cat. Pl. Cub. 146 (1866), not *E. quintuplinerve* Less. *E. nervosum* Griseb. l. c., not Sw. *E. nervosum*, var. *quintuplinerve* (Griseb.) Gomez, Ann. Hist. Nat.

Madrid. xix. 270 (1890).—CUBA: Prov. Oriente: Los Organos, Sept. 20, *Wright*, no. 2805 (TYPE, Gr.); Loma del Gato and vicinity, alt. 900–1000 m., July 11 to Aug. 14, 1921, *Bros. Leon, Clement & Roca*, nos. 10,184 (N. Y., fragm. Gr.) and 10,374 (N. Y., fragm. Gr.); banks of river, Santa Cruz, Aug. 27, *Wright* without number (Gr.); Cuba without precise locality, *Wright*, no. 2804 (Gr.); Sierra Maestra, *Bro. Leon*, no. 11,048 (N. Y., fragm. Gr.).

For many years this Cuban plant has been a puzzle. It is nearly related to several species long known in the more southern West Indian islands, but can be satisfactorily identified with none of them. Grisebach in his Catalogue referred material of it both to the Jamaican *E. nervosum* Sw. and to a newly proposed variety of *E. celtidifolium* Lam. of the Lesser Antilles. The real *E. nervosum* of Jamaica has its leaves rounded or even retuse at the base, more coarsely and sharply dentate, shorter-petioled and somewhat more firmly nerved. *E. celtidifolium* is an arborescent or even arboreous species with much smoother and lighter-colored twigs and with leaves tending to firmer texture, rounded at base and more falcately attenuate at the tip. There is still a third species to which this Cuban material has been at times referred, namely *E. nudiflorum* A. Rich. Fl. Cub. ii. 41 (1853), but this also, though certainly a closely related species, fails to give a satisfactory resting place for the specimens in question since these have cuneate-based leaves while Richard distinctly states regarding his *E. nudiflorum* that its leaves were obtuse or even rounded at base. As to the varietal name *quintuplinerve* employed by Grisebach it seems unwise to use it in the specific category since it has already been published in connection with a very different plant of Brazil.

The specimens here referred to *E. hidrodes*, while agreeing with each other in all essentials, show considerable variation in the size and texture of the leaves and in the size of the heads and the number of florets. In the presence of close resemblance in other respects it is believed that these differences are individual and developed in response to environment and stage of development. A single specimen (P. Wilson's no. 9303 from rocks in the River San Miguel, Prov. Pinar del Rio, at the other end of Cuba and thus separated by a distance of some 400 miles) has coarsely toothed leaves, in this respect showing some approach to the Jamaican *E. nervosum*, but the leaves are cuneate at the base. Without more copious material, this form with toothed leaves probably a mere leaf-variant of *E. hidrodes*—cannot be satisfactorily placed.

The name *hidrodes* alludes to the perspiration-like drops which are abundant on the involucral scales, corollas, and achenes.

E. (§ **Subimbricata**) **Hitchcockii**, spec. nov., herbaceum perenne exaltatum ca. 3 m. altum; caule tereti 1.3 cm. vel ultra diametro glabro fistuloso; foliis oppositis magnis longe petiolatis ovatis acuminatis grosse dentatis basi acutis vel acuminatis in parte proximali penninerviis utrinque glabris subtus pallidioribus textura subcarneo-membranaceis, caulinis 2–2.5 dm. longis 1–1.5 dm. latis, dentibus usque ad 4 mm. altis et 15 mm. basi latis cuspidatis, nervis lateralibus utroque ca. 4 prorsus curvatis; petiolo 4–6 cm. longo; appendicibus stipuliformibus nullis; corymbis terminalibus planiusculis vel modice convexis saepe alternirameis vel irregulariter di- vel trichotomis obscure incurvo-puberulis ca. 2 dm. diametro nudis; bracteolis minimis; pedicellis 3–12 mm. longis filiformibus; capitulis ca. 1 cm. longis et 6 mm. diametro ca. 20-floris; involucri 3–4-seriatim imbricati campanulato-cylindrati squamis ca. 20 gradatis primo paullo puberulis deinde glabratis, exterioribus lanceolato-ovatis ca. 2.5 mm. longis et 1.5 mm. latis obtusis, intermediis similibus sed 3–4 mm. longis et 2 mm. latis, interioribus oblanceolati-linearibus ca. 7 mm. longis et 1 mm. latis; corollis roseis 6 mm. longis gracilibus sursum paullo ampliatis sed sine faucibus distinctis; dentibus limbi deltoideis ca. 0.3 mm. longis puberulis; achaeniis gracilibus atrobrunneis glaberrimis deorsum paullo decrescentibus 2.8 mm. longis; pappi setis ca. 60 brunneo-fulvis corollas aequantibus.—ECUADOR: Province Tungurahua: Valley of Pastaza River between Baños and Cashurco, 8 hours east of Baños, alt. 1300–1800 m., Sept. 25, 1923, *Prof. A. S. Hitchcock*, no. 21,876 (TYPE, Gr.). A notable species not closely related to any hitherto described from Ecuador. Its leaves are as large as those of *E. morifolium* Mill. and the inflorescence recalls that of a *Verbesina*. It is a pleasure to name this well marked new species for its discoverer who, in addition to his special work on the grasses, has, through his copious collecting in difficult tropical regions, contributed much to the knowledge of other groups.

E. (§ **Subimbricata**) **lithophilum**, spec. nov., fruticosum decumbens 3–5 dm. altum aspectu oculo nudo glabrum sed sub lente brevissime puberulum; caule tereti ad 5 mm. diametro firmiter lignescens curvato-decumbenti maturitate a cortice griseo vel pallide brunnescenti tecto; internodiis 4–35 mm. longis, ramis erectis oppositis plerisque ad inflorescentiam simplicibus 2–4 dm. longis teretibus purpurascenti-brunneis superne puberulo-granulatis; internodiis plerisque 1–8 cm. longis; foliis oppositis petiolatis lanceolatis attenuatis basi cuneata integra excepta argute serratis 3–4 cm. longis 1–1.8 cm. latis membranaceis utrinque viridibus supra scabratis subtus paullo pallidioribus obscure in nervis venisque puberulis a basi trinervatis; petiolo gracili

saepius curvato 6–10 mm. longo; capitulis ca. 30-floris ca. 9 mm. altis et 6 mm. diametro in glomerulos paucos 2–3 cm. diametro congestis; pedicellis saepius 1–4 mm. longis; involucri squamis pluriseriatim gradatis lanceolatis vel anguste lanceolato-oblongis purpureobrunneis acutis vix costatis minute resinoso-granulatis et aliquando vernicosis; receptaculo planiusculo glabro; corollis tubulatis roseis vel albis glabris ca. 5.5 mm. longis sine faucibus distinctis; dentibus limbi deltoideis ca. 0.5 mm. longis; antheris apice bene appendiculatis; achaeniis gracilibus praecipue in angulis sursum hispidulis ca. 3 mm. longis apice ab annulo pallido pappifero coronatis; pappi setis ca. 34 flavescenti-albis minute scabratis apice non incrassatis.—PERU: stone fences and rocky cañon-sides, alt. about 2135 m., Aug. 21, 1922, *Macbride & Featherstone*, no. 2235 (TYPE, Field Mus.; ISOTYPE, Gr.). This species, in habit recalling a glomerate-headed *Stevia*, is without close relatives in the Peruvian flora. It bears, however, some slight resemblance to the eastern Brazilian *E. Vauthierianum* DC., but that has much greater stature, much larger leaves, more diffuse inflorescence, more distinctly costulate involucral scales, and puberulent achenes.

E. (§ **Subimbricata**) **mesoreopolum**, spec. nov., fruticosum aliquando scandens; ramis patentibus teretibus post exsiccationem multicostulatis fulvido-tomentellis; foliis oppositis petiolatis ovatis subcrenatis vel integriusculis acuminatis basi abrupte angustatis acutis vel obtusis membranaceis supra brevissime puberulis scabridulis subtus fulvido-tomentellis prominulenter reticulato-venosis 4–11 cm. longis 2–6 cm. latis, venis lateralibus principibus ca. 3-jugis nerviformibus pinnatim a costa 2–11 mm. supra basin divergentibus; petiolo gracili fulvo-tomentello 10–16 mm. longo; paniculis terminalibus multicapitulatis oppositirameis pyramidalibus ca. 10–12 cm. altis 10–18 cm. crassis fulvido-tomentellis; pedicellis filiformibus tomentellis saepe curvatis 4–6 mm. longis; capitulis 18–20-floris ca. 8–9 mm. altis 6 mm. diametro; involucri campanulati 4 mm. alti squamis 22–25 ovatis vel oblongis acutiusculis 3–4-seriatim imbricatis regulariter gradatis dorso 2–3-striato-costulatis tomentellis; receptaculo planiusculo calvo; corollis glabris subtubulatis apicem versus paullo ampliatis ca. 4 mm. longis limbum versus violaceis vel pallide roseis; faucibus vix ullis distinctis; limbi dentibus ovato-deltoideis ca. 0.5 mm. longis; achaeniis stramineis gracilibus glanduloso-atomiferis praecipue ad costas deorsum decrescentibus 2.5–3.5 mm. longis; pappi setis 47–68 inaequalibus laete albis laeviusculis achaenium subaequantibus. –COLOMBIA in the Cordillera Central: shrub in forest at "Pinares" above Salento, Dept. of Caldas, alt. 2600–2900

m., Aug. 2–10, 1922, *Dr. F. W. Pennell*, no. 9209 (TYPE, Gr.), flowers said to be violet; climbing shrub in moist valley at "Calaguala," Coconuco, Dept. of El Cauca, alt. 2500–2800 m., June 14, 18, 1922, *Dr. F. W. Pennell*, no. 7179 (Gr.), flowers said to be pale pink.

This species differs from *E. Stuebelii* Hieron. in its more numerous florets, much looser and more pyramidal inflorescence and thinner less rugose leaves which are pointed at base. From *E. Mayorii* Robinson it differs in its larger and longer-pedicelled fewer-flowered heads, relatively shorter involucre, and longer stramineous gland-sprinkled achenes.

E. (§ **Eximbricata**) **parvulum** Glaziou, Bull. Soc. Bot. Fr. lvi. Mém. 3, 390 (1909). This species, named as a doubtful novelty by Glaziou, l. c., but without diagnosis, seems never to have been described. To give the name legal status the following characterization is here put on record, the characters having been drawn from isotypes (Glaziou's no. 15,150 seen in loans from Kew and from the Botanical Museum of Copenhagen). Herbaceum perenne suberectum 2.5–3 dm. altum; caulibus gracilibus teretibus dense foliosis breviter purpurascenti-pubescentibus ad inflorescentiam simplicibus; foliis plerisque alternis oblanceolatis apice rotundatis basi attenuatis leviter crenatis utrinque viridibus pubescentibus punctatis vix petiolatis 1–1.7 cm. longis 4–6 mm. latis; costa media inconspicua; nervis venisque lateralibus obscuris; corymbis alternirameis terminalibus planiusculis ca. 6 cm. diametro; pedicellis filiformibus purpurascenti-pubescentibus 3–8 mm. longis; capitulis ca. 30-floris ca. 7 mm. altis et 7 mm. diametro; involucri turbinati-campanulati squamis ca. 25 sub-biseriatis vix imbricatis lineari-lanceolatis acutis plerisque subaequalibus, exterioribus subherbaceis purpurascenti-pubescentibus obscure 3-nervatis, interioribus substramineis 1-nervatis subglabris; corollis roseis ca. 3.5 mm. longis; tubo proprio brevi ca. 1 mm. longo in fauces subcylindratas ca. 2 mm. longas gradatim paullo ampliato; dentibus limbi ca. 0.5 mm. longis; achaeniis (immaturis) gracilibus pallidis deorsum attenuatis in angulis hispidulis ca. 3 mm. longis; pappi setis ca. 32 sordide flavescenti-albidis ca. 2.5 mm. longis.—BRAZIL: between Ouro Preto and Queluz, Minas Geraës, Feb.–Mar., *Glaziou*, no. 15,150 (ISOTYPE, K., Copenhagen, phot. and small fragm. Gr.). Of characteristic habit and seemingly very distinct from any Brazilian species hitherto characterized.

E. PENINSULARE Brandegee, Erythea, vii. 4 (1899). This species of Lower California is subject to conspicuous variation in its pubescence, as follows:

Var. *a*. obscure pubescens; foliis utrinque viridibus supra glabrius-

culis subtus praecipue in nervis venisque obscure pubescentibus; petiolo puberulo.—Lower California, San José del Cabo, Sierra de la Laguna, San Francisquito, San Bartolomé, Cañon Hondo, Mesa Verde.

Var. β. **epipolimum**, var. nov., griseo-tomentellum; foliis utrinque griseis minute papilloso-puberulis; petiolo dense patenterque griseo-tomentello.—Lower California: Aguaje de Santana, 56 km. north of San Ignacio, alt. 1037 m., Oct. 4, 1905, *E. W. Nelson & E. A. Goldman*, no. 7186 (U. S., fragm. Gr.).

In habit, leaf-form, inflorescence, involucre, etc., agreeing with the smoother typical variety and clearly conspecific with it, but certainly meriting varietal distinction. Material collected at San Juleo Cañon, *Brandegee*, Apr. 20, 1889 (Mo., fragm. Gr.) is intermediate.

E. (§ **Subimbricata**) **procerum**, spec. nov., fruticosum elatum ca. 4.5 m. altum; caulibus teretibus dense crispeque fulvido-tomentellis tardius glabratis post exsiccationem leviter costulatis medullosis 3–8 mm. diametro; internodiis 2–10 cm. longis; foliis oppositis lanceolato- vel ovato-oblongis vel rhombeo-ovatis petiolatis apice acutis vel acuminatis basi subacutis vel obtusis vel etiam rarius rotundatis margine irregulariter grosseque serrato-dentatis vel undulatis vel aliquando etiam integris supra scabris bullatis subtus vix pallidioribus molliter tomentosis textura crassiusculo-membranaceis 8–15 cm. longis 3–6.7 cm. latis penniveniis vel paullo supra basin pinnatim subnervatis; petiolo fulvido-tomentoso 8–13 mm. longo plerumque erecto vel suberecto; corymbis terminalibus et in axillis superioribus orientibus pedunculatis convexis subdensis multicapitulatis 1–3 dm. diametro; pedicellis 4–9 mm. longis tomentellis; capitulis ca. 12-floris 10–12 mm. altis 6–7 mm. diametro; involucri squamis ca. 15 laxe subtriseriatim imbricatis lanceolato-oblongis valde inaequalibus obtusis vel subacutis, extimis ca. 3 mm. longis et 1.2 mm. latis subherbaceis griseo-tomentellis, intimis 6–7 mm. longis ca. 1 mm. latis plerumque 3-costulatis saltim apicem versus puberulo-tomentellis purpurascentibus; corollis rubro-lilaceis glabris 5–6.5 mm. longis glabris; tubo sine faucibus distinctis ca. 5 mm. longo vix sursum ampliato; dentibus limbi patentibus deltoideis 0.7–0.9 mm. longis; achaeniis gracilibus deorsum attenuatis fuscescentibus granulato-scabratis ca. 5 mm. longis; pappi setis ca. 35 flavido-albidis ca. 5.5 mm. longis.—Peru: on steep shrubby slopes, with flowers red-lilac and fragrant, alt. about 2745 m., at Mito, July 8–22, 1922, *Macbride & Featherstone*, no. 1551 (type, Field Mus.; isotype, Gr.); also 3 sheets from herb. of Pavon from Peru but without recorded locality (herb. Univ. Geneva).

This species must be rather closely related to the little known *E. helianthifolium* HBK., which came from Ayavaca toward 1000 km. northward from the Mito material here described. *E. helianthifolium* is known to the writer from a photograph which he made of the type material at Paris some years ago. Microscopic examination of this photograph and close study of the brief and rather unsatisfactory original description seem to leave no doubt as to the probable distinctness of the species here characterized. In *E. helianthifolium* the leaves are much more regularly and definitely serrate, their lateral veins leave the midnerve at a somewhat greater angle and are less curved forward in their course, the upper surface is scabrid, but not at all, or at least by no means to the same extent bullate, the petioles tend to spread widely instead of rising parallel to the stem, and according to the original description the leaves are reticulate-veiny and are beneath punctate with very numerous orange-glands—a feature not observable in the material of *E. procerum*. Finally the inner involucral scales of *E. helianthifolium* are said to be glabriusculous while in *E. procerum* the inner as well as the outer scales are at least toward the tip clearly pubescent. These differences, though individually of no great strength, are numerous and, especially when taken in conjunction with the remoteness of the stations, seem to show the plants pretty certainly distinct.

E. SOLIDAGINOIDES HBK. Nov. Gen. et Spec. iv. 126 (1820). This widely distributed and variable species has long been known from Mexico and Central America, Venezuela, Colombia, Ecuador, and Bolivia, but until now does not appear to have been recorded from Peru. It has, however, been recently collected at the following points in that country; as a slender shrub 1.5 m. high with few erect branches and greenish-yellow flowers, at a hacienda 9 miles above Huertas, Cabello, alt. about 2440 m., June 25, 1922, *Macbride & Featherstone*, no. 1321 (Field Mus., Gr.); as a slender open shrub-liana of dense montaña and with greenish flowers, at La Merced, alt. about 610 m., Aug. 10–24, 1923, *J. F. Macbride*, no. 5258 (Field Mus., Gr.), a form with large subentire leaves; also on a disintegrating granite river-bluff, at the same place, date, and elevation, *Macbride*, no. 5333 (Field Mus., Gr.), a form distinctly lignescent but with a root suggesting that of an annual.

E. (§ **Subimbricata**) **sphagnophilum**, spec. nov., fruticosum erectum; caulibus paucis strictis simplicibus vel adscendenter ramosis teretibus medullosis fusco- vel brunnescenti-tomentellis ca. 9–12 dm. altis ad 8 mm. vel ultra crassitudine; internodiis 2–6 cm. longis; foliis oblongis utroque acutis argute serratis (dentibus 1–1.5 mm. altis 2–3

mm. basi latis) 6–10 cm. longis 2.5–4.7 cm. latis chartaceo-coriaceis penniveniis et utrinque prominulenter reticulato-venosis supra granuliferis subtus paullo pallidioribus crispe fulvido-pubescentibus; venis lateralibus principibus utroque 8–11 prorsus curvatis; petiolo 7–12 mm. longo tomentello; corymbis terminalibus planiusculis vel modice convexis 4–9 cm. diametro densis; pedicellis ca. 2 mm. longis; capitulis 5–6-floris 8–10 mm. longis 5–7 mm. diametro; involucri campanulati squamis ca. 11 valde inaequalibus gradatis obtusis vel apice rotundatis vix costulatis dorso pubescentibus, extimis lanceolatis 2.5 mm. longis 0.7 mm. latis, intermediis oblongis ca. 5 mm. longis et 2 mm. latis, intimis anguste oblanceolato-oblongis ca. 5.5 mm. longis; corollis purpureis albis glabris; tubo sursum gradatim ampliato ca. 4.3 mm. longo sine faucibus distinctis; dentibus limbi ovato-deltoideis ca. 1.2 mm. longis; achaeniis immaturis glabris 2.5 mm. longis; pappi setis ca. 35 inaequalibus sursum barbellatis attenuatis flavidulo-albis plerisque 3.5–4 mm. longis.—PERU: a few-stalked strict bush on sphagnum slopes, alt. about 1830 m., Villacabamba, Hacienda on Rio Chinchao, July 17–26, 1923, *J. F. Macbride*, no. 4968 (TYPE, Field Mus.; ISOTYPE, Gr.). Probably best placed near *E. Macbridei* Robinson, from which, however, it is readily distinguished by its much lower stature, shorter leaves with different indumentum, and purple flowers.

E. THEAEFOLIUM Benth. Pl. Hartw. 199 (1845). The type of this species from the slopes of Mt. Sotaro in the Province of Popayan had leaves 1–1½ inches in length, 4–7 lines wide, oblong in form and, as described by Bentham, acute at both ends. This form may be known as var. **typicum**. From it all material subsequently referred to the species differs in varying degree. The following seems worthy of varietal distinction.

Var. **subellipticum**, var. nov., foliis subellipticis vel elliptico-oblongis apice rotundatis vel obtusis vel rarius subacutis basi plerumque rotundatis 18–25 mm. longis 13–16 mm. latis; aliter formae typicae speciei simillimum.—COLOMBIA: in mountainous districts, Province of Bogotá, alt. 2700 m., Feb. 1854, *Triana*, no. 1221 (TYPE, Par., phot. and small fragm. Gr.); Prov. Pamplona la Baja, alt. 2440 m., *L. Schlim*, no. 1056 (hb. Univ. Geneva). VENEZUELA: Páramo del Tamboi, Merida, *Jahn*, no. 747 (U. S., phot. and fragm. Gr.); also *Linden*, no. 464 (Gr., Univ. Geneva). This material secured by Linden bears his Caracas label but error is suspected since the species not otherwise known from the coast of Venezuela is abundant in parts of Colombia traversed by this collector.

E. UBER Robinson, Proc. Am. Acad. lv. 37 (1919). After publish-

ing this Peruvian plant, which had been carefully differentiated from other Andean species of the genus, the writer noticed its likeness to *E. rufescens* Lund of Atlantic Brazil. This resemblance, though striking, did not appear to reach specific identity.

It has recently been possible, through the kindness of Capt. John Donnell Smith, of Baltimore, to borrow from his herbarium a sheet of excellent Brazilian material of *E. rufescens*. This, carefully compared at the Gray Herbarium with a fragment of the type of *E. uber*, discloses the following differences.

E. rufescens: leaves tomentose beneath; inflorescence distinctly pyramidal; involucral scales 3.5–4 mm. long, soft in texture, dorsally tomentose except for the hyaline margin, also sometimes glandular-atomiferous; achenes glabrous or merely with minutely scabrid angles (sometimes with a few scattered sessile glands).

E. uber: leaves finely and somewhat sparsely pubescent beneath; inflorescence flattish or only moderately convex; involucral scales 4.5–5 mm. long, of firmish texture, dorsally granular and very sparingly puberulent; achenes setulose.

These distinctions, while none of them strong, are in combination sufficient to make probable the distinctness of these species, especially as they are separated by such distance and belong to floras in general so different as those of the Andean portions of Peru and the coastal parts of Brazil.

E. (§ **Subimbricata**) **variolatum**, spec. nov., ut videtur herbaceum perenne 3–4 dm. altum erectum pluricaule a caudice paullo lignescenti; caulibus gracilibus teretibus rectis virgatis 1–2 mm. diametro griseo-puberulo a basi ad inflorescentiam foliosissimis; foliis alternis sessilibus lineari-spatulatis crassiusculis integerrimis apice obtusiusculis 3–7 mm. longis 0.4–1.1 mm. latis supra subglabris subtus sparse griseo-puberulis utrinque quasi variolatis cum glandulis (post exsiccationem) depressis; foliis primariis fere omnibus proliferis et in axillis folia plura paullo minora gerentibus; corymbo terminali alternirameo convexo multicapitulato griseo-tomentello; pedicellis filiformibus ca. 2 mm. longis; capitulis ca. 5-floris ca. 6 mm. altis et 4 mm. diametro; involucri squamis ca. 11 valde inaequalibus 2–3-seriatis erubescentibus griseo-tomentellis, exterioribus 4–5 lanceolatis subacutis 1–2 mm. longis, interioribus elliptico-oblongis conspicue ciliatis 3–4.5 mm. longis 1.7 mm. latis; corollis ut videtur rubritinctis ca. 3.5 mm. longis paullo granulatis, tubo proprio ca. 1 mm. longo, faucibus subcylindratis paullo ampliatis ca. 2 mm. longis, dentibus limbi ca. 0.6 mm. longis; achaeniis glabris crassis vix 1.5 mm. longis sublucidis brunneis; pappi setis ca. 40 albidis barbellatis.—Brazil: Prov. St.

Paul and Rio Grande do Sul, *Auguste de Saint-Hilaire*, no. 871 Catalogue C² No. 1553 (TYPE, Par., phot. and small fragm. Gr.).

E. variolatum forms a new member of the little series *Disynaphia* (Hook. & Arn.) Bak. In this group it differs from *E. ericoides* DC. and *E. angustissimum* Spreng. by its obtuse puberulent and pitted leaves; from *E. calyculatum* Hook. & Arn. (*Stevia calycina* DC. and *Disynaphia monteridensis* DC.) in its smaller heads, elliptical and obtuse inner involucral scales, very small leaves, etc., from *E. ligulaefolium* Hook. & Arn. (*E. gnidioides* DC.) and *E. spatulatum* Hook. & Arn. (*E. halimifolium* DC.) in its much smaller and less pubescent but (under lens) distinctly variolate leaves, from *E. multifolium* Robinson in its very much smaller, relatively narrower leaves, more open inflorescence and smaller heads.

In its characteristic habit *E. variolatum* recalls some species of *Petalostemon*. Two sheets of this species were found in a recent loan from the Paris Museum of Natural History sent to the writer for study and identification. While both were from the collection of Auguste de Saint-Hilaire and bore identical numbers, one had the label form for "Province de Saint-Paul" and the other for "Province de Rio Grande do Sul." It seems probable that the material, which is identical in form, development and condition from drying, was collected at one time and place, and that one of the labels was correct and the other used by error. The species is so characteristic that its recognition on rediscovery should not offer any difficulties.

Mikania (§ **Spiciformes**) **aquaria**, spec. nov., robusta scandens; caulibus teretibus ad 12 mm. diametro usque ad inflorescentiam glabris fistulosis et cum aqua impletis post exsiccationem multicostulatis; ramis oppositis patentibus; internodiis 2 dm. vel ultra longitudine; foliis oppositis ovatis acuminatis integris basi vel profunde cordatis vel subtruncatis et cum acumine in petiolum paullo decurrentibus subcoriaceis supra atroviridibus impresse reticulatis lucidulis glaberrimis subtus pallidioribus opacis olivaceis minutissime pulverulentipuberulis prope basin palmatim vel pinnatim 5–9-nervatis 20–23 cm. longis 15–17 cm. latis; petiolo 7–9 cm. longo; paniculis magnis lateralibus vel terminalibus 1.5–4 dm. altis 1–3 dm. diametro foliaceo-bracteatis crispe puberulis; bracteis ovatis vel ovato-oblongis utroque acutatis 3–8 cm. longis 1.5–4 cm. latis petiolatis; spicis laxis 3–7 cm. longis; rhachi gracili plerumque leviter curvata; capitulis sessilibus late patentibus vel divaricatis; bracteolis ovatis acuminatis ciliatis ca. 1.6 mm. longis; involucri squamis anguste oblongis ciliolatis apice rotundatis et mucronulatis ca. 3.8 mm. longis et 1.2 mm. latis 3–5-nervatis; flosculis fragrantibus; corollis glabris albis; tubo proprio

ca. 2 mm. longo apice sensim constricto; faucibus anguste turbinatis ca. 1.5 mm. longis; dentibus limbi deltoideis 0.5 mm. longis; achaeniis nigrescentibus 2.6 mm. longis scabridulis; pappi setis ca. 36 sordide albidis vix apicem versus incrassatis ca. 3.8 mm. longis.—PERU: a liana with succulent hollow and water-filled stems, growing on the montaña along open stream, alt. about 610 m., Aug. 10–24, 1923, *J. F. Macbride*, no. 5242 (TYPE, Field Mus.; ISOTYPE, Gr.). A well marked species, probably related to the Bolivian *M. cinnamomifolia* Lingelsh. and *M. dioscorcoides* (Rusby) Robinson, but having larger heads and different foliage.

M. (§ **Thyrsigerae**) **cryptodonta,** spec. nov., volubilis subherbacea glabriuscula; caule subtereti post exsiccationem purpurascenti-brunneo flexuoso pluricostulato primo obscure puberulo; internodiis 1–2 dm. vel ultra longitudine; foliis oppositis graciliter petiolatis ovatis acuminatis basi subtruncatis vel late subcordatis vel distincte cordatis margine revolutis remote obscureque cuspidato-dentatis (dentibus vix 0.2 mm. altis 5–10 mm. inter se distantibus) membranaceis 8–14 cm. longis et 5–10 cm. latis a basi subpalmatim 5-nervatis utrinque obscurissime in nervis sordide puberulis aliter glabris subtus paullo pallidioribus; petiolo 3–4.5 cm. longo puberulo, eis ejusdem jugi ab annulo prominulenti conjunctis; paniculis pyramidatis laxiusculis axillaribus pedunculatis 1.5–2 dm. longis ca. 1 dm. diametro; capitulis 8-9 mm. longis ad apices ramulorum irregulariter subcymosis aliis subsessilibus aliis graciliter pedicellatis; pedicellis 0.5–3 mm. longis; bracteolis oblanceolato- vel spathulato-linearibus; involucri squamis lineari-oblongis obtusis apice puberulis; corollis albidis glabris ca. 5 mm. longis; tubo proprio gracili 2.3–2.7 mm. longo; faucibus campanulatis 1.2–1.4 mm. altis; dentibus limbi deltoideis 1–1.3 mm. longis; achaeniis gracilibus fuscis minutissime scabratis deorsum attenuatis 3.2–4 mm. longis; pappi setis ca. 36 albidis apicem versus non incrassatis 4.5–5 mm. longis.— PERU: herbaceous or nearly so, clambering over stumps or in sunny woods, about 610 m. alt., Pozuzo, June 20–22, 1923, *J. F. Macbride,* no. 4683 (TYPE, Field Mus.; ISOTYPE, Gr.), and no. 4552 (Field Mus., Gr.). Most nearly related to *M. decora* Poepp., but differing in its thinner smoother more deltoid-ovate rather than oblong leaves, longer petioles and cymose rather than racemoid disposition of the heads in the inflorescence.

M. DECORA Poepp. in Poepp. & Endl. Nov. Gen. ac Spec. iii. 53 (1845). Material with the technical characters of *M. decora* but differing clearly in several minor features may be varietally appended to this species and distinguished from the typical variety as follows:

Var. **typica**, foliis subtus distincte in nervis puberulis; nervis

lateralibus ab costa saepuis ca. 5–8 mm. supra basin divergentibus; petiolo ca. 1.5 cm. longo.

Var. **heteroneura**, var. nov., foliis (ad maturitatem) subtus glabris; nervis lateralibus 3-jugis distincte pinnatis, jugo tertio 1.5–2.5 cm. supra basin oriente; petiolo 2–2.5 cm. longo.—PERU: liana with greenish flowers and pinkish pappus, Villacabamba, Hacienda on Rio Chinchao, alt. about 610 m., July 17–26, 1923, *J. F. Macbride*, nos. 5167 (TYPE, Field Mus.; ISOTYPE, Gr.) and 5191 (Field Mus., Gr.). The distance of the upper pair of lateral nerves from the leaf-base is so great that the leaf becomes truly pinnate-veined. The leaves also are somewhat less sharply acuminate than in the typical variety and the cross-veining between the nerves is less regular.

M. (§ **Corymbosae**) **Gleasonii**, spec. nov., volubilis elata verisimiliter fruticosa saltim suffruticosa inflorescentiis exceptis aspectu glaberrima; caule leviter hexagono post exsiccationem pluricostulato glabro 3–4 mm. vel ultra crasso; internodiis usque ad 14 cm. longis; foliis oppositis petiolatis oblongis acuminatis integris basi acutis vel subobtusis paullo supra basin pinnatim 5-nervatis supra nitidis lucidis impresse reticulatis subtus concoloribus minutissime obscureque puberulis 9–15 cm. longis 4–7 cm. latis coriaceis margine revolutis; petiolo 2–2.5 cm. longo plerumque carvato supra canaliculato, eis ejusdem jugi ab annulo prominulento obscuro transverso conjunctis; bracteis foliaceis petiolatis; corymbis saepe binis vel trinis ex eodem axillo graciliter pedunculatis valde inaequalibus (verisimiliter partialibus in corymbo arcte sessili) 4–6 cm. diametro laxis valde convexis fusco-puberulis conjunctim inflorescentiam terminalem interruptam paniculatam ad 2.5 dm. vel ultra longitudine formantibus; pedicellis plerisque 4–8 mm. longis; bracteolis lanceolatis vel anguste oblongis 3–4 mm. longis plerumque ad vel prope summam partem pedicelli orientibus; capitulis ca. 9 mm. longis; involucri squamis anguste oblongis 7–8 mm. longis 1.3–1.6 mm. latis apicem versus minutissime puberulis aliter glabris brunneis; corollis glabris (immaturis) ca. 5 mm. longis tubulatis paullo sursum ampliatis sine faucibus distinctis in parte superiori vinaceo-purpureis; dentibus limbi ca. 0.8 mm. longis; achaeniis valde immaturis glabris ca. 2.8 mm. longis; pappi setis ca. 50 albidis ca. 5 mm. longis vix sursum incrassatis.—BRITISH GUIANA: dense upland forest, Rockstone, July 15–Aug. 1, 1921, *Dr. H. A. Gleason*, no. 681 (TYPE, in herb of N. Y. Bot. Gard., sk. and fragm. Gr.). A well marked species with thick shining leaves recalling those of many *Lauraceae*. In inflorescence this species is somewhat vaguely intermediate between § *Corymbosae* and § *Thyrsigerae*, its apparently sessile corymbs being

loose and very convex and disposed along the branches so as to form a lax and interrupted panicle. It is a pleasure to commemorate in the naming of this species the very notable work accomplished by its collector in the exploration of British Guiana.

M. INCASINA Robinson, Contrib. Gray Herb., n. ser. lxiv. 11, 82 (1922). This species has hitherto been known only from the original material collected by Alexander Mathews eighty or ninety years ago. It was scarcely in anthesis and showed only the upper, probably rameal leaves. Specimens which appear to be specifically identical have recently been collected by Mr. J. F. Macbride (no. 5778, Field Mus., Gr.) on sunny brush at La Merced, Hacienda Schunke, Peru, alt. about 1220 m. These are in advanced anthesis and exhibit not merely the rameal but the considerably larger cauline leaves which are rounded at the sides of the base but have the same narrowly deltoid-ovate form. They are sometimes as much as 18–22 cm. long and 9–10 cm. wide with petiole 4 cm. long; the floral characters agree closely with those of the type though from greater maturity the dimensions are somewhat larger than those described in the original characterization. A noticeable trait is found in the tendency of the mature involucral scales to bend rather sharply backward and outward at the point where the deltoid tip begins. This spreading tip appears to be of softer texture than the rest of the scale, which in full maturity becomes firmish in character.

M. NIGROPUNCTULATA Hieron., var. **denticulifolia**, var. nov., foliis margine distincte cuspidato-denticulatis; dentibus ca. 0.5 mm. altis plerisque 2–9 mm. inter se distantibus; aliter var typicae similis. —COLOMBIA: Dept. of El Cauca: climbing shrub in bushy forest, alt. 2400–2700 m., Cordillera Occidental, June 28, 1922, *Pennell & Killip*, no. 7430 (Gr.).

M. (§ **Globosae**) **hesperia**, spec. nov., fruticosa volubilis; caule subtereti post exsiccationem costato patenter piloso vel subsetoso et dense cum glandulis nigrescentibus globosis sessilibus vel brevissime stipitatis ornato ca. 3 mm. vel ultra diametro; internodiis plerisque 4–5 cm. longis; foliis oppositis breviter petiolatis oblongo-lanceolatis attenuato-acuminatis basin versus gradatim angustatis sed ad basin veram abrupte rotundatis penniveniis margine cuspidato-denticulatis (dentibus ca. 0.4 mm. altis et 5–7 mm. inter se distantibus) membranaceis utrinque viridibus supra in costa obscure puberulis subtus in costa et nervis principibus appresso-pilosis in superficie minute nigropunctatis utrinque prominenter reticulato-venosis 12–14 cm. longis 2.5–4 cm. latis; petiolo crasso setoso-piloso fuscescenti 4–5 mm. longo; panicula terminali 1–1.5 dm. longo vix 4 cm. diametro

(immatura) oppositiramea setoso-pilosa; ramis paniculae adscendentibus brevibus a bracteis foliaceis multo superatis; capitulis ca. 8 mm. longis subsessilibus in glomerulos subglobosos ca. 2 cm. diametro dispositis; bracteolis subherbaceis pilosis nigropuncticulatis ca. 2–3 mm. longis et 1.5 mm. latis; involucri squamis oblongis obtusis apicem versus puberulis et saepissime nigropunctatis ca. 4–4.5 mm. longis et 1.2–1.3 mm. latis; corollis purpureis ca. 4 mm. longis; tubo proprio gracili ca. 1.5 mm. longo; faucibus subcylindrato-campanulatis ca. 1.5 mm. longis; dentibus limbi ca. 1 mm. longis; achaeniis (valde immaturis) glabris 2 mm. longis non punctatis; pappi setis ca. 25 albis.—COLOMBIA: Dept. of El Cauca; in bushy forest, "San José," San Antonio, Cordillera Occidental, alt. 2400–2700 m., June 28, 1922, *Pennell & Killip*, no. 7430 (TYPE, Gr.).

This plant, at first suspected to be a variety of *M. nigropunctulata* Hieron., is found to differ from that species (of which a photograph of the type has recently been obligingly supplied to the writer from the Botanical Museum at Berlin) in the following points: its leaves are longer and relatively much narrower, their margins instead of being entire are distinctly denticulate, they are more regularly feather-veined and the veinlets instead of being impressed are prominulent on the upper surface; the internodes are shorter, not exceeding 4–6 cm., and the petioles are scarcely half as long as in *M. nigropuncticulata*. The corollas are deep purple while Hieronymus states the flowers of *M. nigropuncticulata* to be "cinereo-albidi." *M. lanceolata* Hieron. of Ecuador with somewhat similar habit is a smoother plant with entire subcoriaceous less gradually attenuate leaves and somewhat more loosely spreading inflorescence, the branches equalling or exceeding the subtending bracts.

M. (§ **Thyrsigerae**) **Hitchcockii**, spec. nov., fruticosa reclinans; ramis elongatis teretibus dense fulvescenteque villoso-tomentosis 4 mm. vel ultra crassis; internodiis usque ad 14 cm. longis; foliis oppositis petiolatis ovatis vel ovato-oblongis gradatim acuminatis obsolete cuspidato-dentatis (dentibus obscuris brevissimis 4–13 mm. inter se distantibus) basi late rotundatis paullo supra basin pinnatim vel subpalmatim 5(–7)-nervatis membranaceis supra juventate appresse villosis maturitate (nervis villosis exceptis) glabratis prominulenter reticulatis subtus fulvescente villoso-tomentosis 11–13 cm. longis 5.5–6.5 cm. latis; nervis per venas transversas subparallelas conjunctis; petiolo 2–2.5 cm. longo dense fulvescenteque tomentoso; paniculis axillaribus oppositis vel terminalibus longe pedunculatis ovoideo-pyramidatis oppositirameis 1–2.5 dm. altis 12–20 cm. crassis; bracteis linearibus dense sericeo-velutinis 3–10 mm. longis; capitulis ca. 4 mm. altis

graciliter pedicellatis in ramulis ultimis subracemose dispositis; pedicellis plerisque 1.5–2 mm. longis; bracteolis lanceolatis ca. 1 mm. longis ad basin pedicelli affixis; involucri squamis anguste oblongis maturitate brunneis apice rotundatis vix nervatis apicem versus dorsaliter puberulis et margine ciliatis aliter glabris; corollis albis ca. 2.5 mm. longis; tubo proprio ca. 1 mm. longo gracili; faucibus modice ampliatis subcylindratis ca. 1–1.2 mm. longis; dentibus limbi ca. 0.4 mm. longis; achaeniis (immaturis) atrobrunneis glabris ca. 2 mm. longis; pappi setis ca. 30 corollas subaequantibus albidis.—ECUADOR: Prov. Tungurahua: Valley of the Pastaza River between Baños and Cashurco, 8 hours east of Baños, alt. 1300–1800 m., Sept. 25, 1923, *Prof. A. S. Hitchcock*, no. 21,818 (TYPE, Gr.).

This species has rather closely the habit of the widely distributed Cordilleran *M. Ruiziana* Poepp., but differs in having decidedly smaller heads and florets, and in having the bractlets borne at the base of the pedicel and not as in *M. Ruiziana* at the summit and closely subtending the head.

M. (§ **Thyrsigerae**) **inornata**, spec. nov., volubilis verisimiliter fruticosa glabra; caule hexagono ad 5 mm. diametro; internodiis 5–23 cm. vel ultra longitudine; ramis flexuosis tortis; foliis oppositis oblongo-ovatis acuminatis basi acutis vel subrotundatis margine integerrimis vel obscure remoteque undulato-dentatis utrinque glaberrimis viridibusque concoloribus textura subcarnosis prope basin pinnatim 5-nerviis 8–11 cm. longis 3–6 cm. latis; petiolo 2–4 cm. longo, eis ejusdem jugi basi ab annulo suberoso prominenti transverso conjunctis; appendicibus stipuliformibus nullis; panicula laxa interrupta ramosa elongata; inflorescentiis partialibus breviter pedunculatis patentibus 5–20-capituliferis corymbiformibus 2–4 cm. diametro subdensis; bracteis ovatis 1–3 cm. longis; bracteolis oblongo-ovatis herbaceis ciliatis acutis involucrum subaequantibus ad apicem pedicelli orientibus; pedicellis gracilibus plerisque ca. 2 mm. longis; involucri anguste ovoidei squamis oblongis vix acutatis obscure plurinerviis ca. 6 mm. longis 1.6–2 mm. latis erosis glabris; corollis viridescentibus ca. 5 mm. longis glabris; tubo proprio ca. 2.5 mm. longo basin versus paullo constricto; faucibus brevissimis campanulatis; dentibus limbi oblongis acutiusculis ca. 1.8 mm. longis et 0.8 mm. latis; achaeniis griseis maturitate crassiusculis glabris ca. 3 mm. longis; pappi setis numerosis ca. 100 carneo-albidis corollam maturitate superantibus.—PERU: "on sunny shrubs," alt. about 1067 m., July 19–25, 1923, *J. F. Macbride*, no. 5061 (TYPE, Field Mus.; ISOTYPE, Gr.). In its slightly fleshy or succulent character recalling *M. carnosa* Muschler and *M. montana* described below, but differing from both in its hexagonal

branches, much larger leaves, broader involucral scales, stouter achenes, and in the disposition of its heads in an elongated loose panicle with much less corymbose tendency, a feature which imposes the necessity of placing the species in § *Thyrsigerae*. Flowers said to be greenish.

M. (§ **Thyrsigerae**) **lasiopoda**, spec. nov., fruticosa scandens; caulibus flexuosis tortis lignescentibus medullosis teretibus 4–5 mm. diametro praecipue nodos versus subsetoso-pubescentibus aliter maturitate subglabratis sed scabratis post exsiccationem leviter costulato-angulatis; internodiis ad 2 dm. vel ultra longitudine; ramis oppositis patentibus; foliis lanceolato-oblongis attenuatis integris basi angustatis distincte cordatis (vel apud folia ramea rotundatis vel obtusis) pinnatim nervatis vel subregulariter penniveniis supra glabris lucidulis minute impresseque reticulatis post exsiccationem fuscescentibus subtus laxe sordideque pubescentibus olivaceis minute punctatis firmiter membranaceis 8–14 cm. longis 3–5.5 cm. latis; petiolo brevissimo robusto dense setoso-piloso 1–4 mm. longo; eis ejusdem jugi basi annulo obscuro plus minusve incrassato setoso transverse conjunctis; paniculis ramos terminantibus ovoideo-pyramidatis 1.5–3 dm. longis 8–15 cm. diametro sordide pubescentibus; pedicellis gracilibus plerisque 1–3 mm. longis; bracteis bracteolisque ovato-lanceolatis acutis laxe pilosis parvis; involucri squamis anguste oblongis subacutis 3.5 mm. longis ca. 1 mm. latis maturitate subglabris tenuibus brunnescentibus; corollis glabris, tubo proprio gracili ca. 1.5 mm. longo; faucibus campanulatis ca. 1.4 mm. altis; dentibus limbi deltoideis ca. 0.7 mm. longis; achaeniis gracilibus glabris deorsum decrescentibus acute angulatis fusco-griseis ca. 1.7 mm. longis; pappi setis ca. 37 tenuibus albis sublaevibus corollam subaequantibus.—PERU: a "liana of montaña river-slope," with flowers odorless and whitish, alt. about 1220 m., Aug. 10–24, 1923, La Merced, *J. F. Macbride*, no. 5567 (TYPE, Field Mus.; ISOTYPE, Gr.); also "on sunny brush," flowers dirty-greenish, alt. about 1220 m., Aug. 27 to Sept. 1, 1923, La Merced, Hacienda Schunke, *J. F. Macbride*, no. 5729 (Field Mus., Gr.). This species keys out to the neighborhood of *M. lancifolia* Robinson but differs in having broader thinner leaves which are sublucid above and (at least the cauline) distinctly cordate at the narrowed base; furthermore its involucral scales are more obtuse, its panicle less leafy, and its achenes shorter than in *M. lancifolia*. There can be no doubt that it is a distinct species. The name, of course, alludes to the shaggy petioles.

M. (§ **Thyrsigerae**) **Macbridei**, spec. nov., fruticosa verisimiliter scandens vel in fruticetis inclinans robusta; caule 6–8 mm. crasso

tereti a basibus pilorum delapsorum quasi granulato-scabrato; ramis oppositis patentibus griseo- vel albido-lanatis; internodiis 8–14 cm. longis; foliis oppositis, caulinis ovatis acutis integris vel obscure undulato-dentatis (dentibus 1–1.5 cm. inter se distantibus) basi rotundatis textura coriaceis supra maturitate glaberrimis viridibus rugulosis subtus niveo-tomentosis pinnatinerviis 1.6–2 dm. longis 8–12 cm. latis; nervorum jugis principibus 2–3 supra basin 1–40 mm. orientibus prorsus curvatis supra sulcatis subtus prominentibus; petiolo 2.8–3.5 cm. longo dense albo-tomentoso, eis ejusdem jugi basi ab annulo crasso conjunctis; foliis rameis ovato-oblongis 7–10 cm. longis 3.5–6 cm. latis; paniculis ramos terminantibus ovoideis magnis oppositirameis 2.5–3 dm. longis 1.5 dm. crassis divaricatim ramosis albo-tomentellis; capitulis ad apices ramulorum plerisque binis vel ternis subsessilibus ca. 8 mm. longis; involucri squamis oblongis ca. 4 mm. longis 1–1.4 mm. latis apice rotundatis dorso subsericeo-puberulis maturitate rigidiusculis; corollis glabris pallide viridibus ca. 4 mm. longis; tubo proprio gracili ca. 1.5 mm. longo; faucibus campanulatis ca. 1.5 mm. longis; dentibus limbi ca. 1 mm. longis deltoideis; achaeniis gracilibus fusco-griseis glabris deorsum decrescentibus 3.2–3.7 mm. longis; pappi setis ca. 30 sordide albidis corollam subaequantibus.—PERU: "on sunny brush, flowers light green," alt. about 1220 m., Aug. 27–Sept. 1, 1923, *J. F. Macbride*, no. 5728 (TYPE, Field Mus.; ISOTYPE, Gr.).

Available material of this very well marked species is rendered the more striking from the fact that all but the youngest leaves are covered beneath by a very curious white porous veil-like coating which on examination by my cryptogamic colleagues, Thaxter and Dodge, proves to be undoubtedly a fungus-mycelium. Unfortunately no fruiting portions have been found and identification is impossible. This close membranelike network completely covers and obscures the normal pubescence in the mature leaves without however greatly changing the shade, for both are a very light gray, in fact nearly white. The *Mikania* seems to have developed normally and to have matured well ripened achenes notwithstanding the presence of the fungus, which appears to be confined to the lower leaf-surface.

M. Macbridei may perhaps be best placed next or at least near to *M. lanuginosa* DC. but differs from that species in its subsessile heads which are cymose rather than subracemose in disposition, and in its leaves which are larger, firmer, rounded at the base and nearly glabrous above.

In naming this striking species it is a pleasure to commemorate Mr. Macbride's notable progress in the exploration of the Peruvian flora.

M. (§ **Corymbosae**) **montana**, spec. nov., scandens paullo lignescens infra inflorescentiam glaberrima; caule tereti articulato ca. 4 mm. diametro flavido-brunneo laevi; internodiis 2–4 cm. longis; nodis ab annulo prominulo suberoso tenui circumcinctis; foliis oppositis petiolatis ovatis glaberrimis carnosis acutis basi rotundatis et breviter ad insertionem petioli acutatis a basi 5–7-nervatis subtus paullo pallidioribus impresse reticulato-venosis margine utroque distanter 1–4-cuspidato-dentatis 3–5 cm. longis 1.5–3 cm. latis; petiolo ca. 1.5 cm. longo gracili glabro, eis ejusdem jugi ad basin annulo conjunctis; corymbis terminalibus et lateralibus trichotomis ca. 8 cm. diametro conjunctim paniculam laxam foliaceo-bracteatam formantibus granuloso-puberulis; bracteis superioribus ovatis acuminatis ca. 1 cm. longis; bracteolis oblongis acutis a summa parte pedicelli orientibus et involucrum aequantibus; pedicellis gracilibus 3–4 mm. longis; capitulis plerisque in cymulos 3-capituliferos symmetrice dispositis 1 cm. longis; involucri squamis herbaceo-substramineis oblongis obtusis vel acutiusculis apice ciliatis dorso glabris vel apicem versus puberulis ecostatis basi paullo calloso-incrassatis; corollis gracillimis glabris; tubo proprio 3 mm. longo; faucibus brevissimis ca. 0.5–0.7 mm. longis; dentibus limbi linearibus ca. 3.5 mm. longis et 0.6 mm. latis; achaeniis glabris gracilibus 4.5 mm. longis; pappi setis ca. 80 inaequalibus plerisque 4.5–5 mm. longis albidis vix scabratis.—PERU: a liana on shrub-montaña, Huacachi near Muña, alt. about 1982 m., May 20–June 1, 1923, *J. F. Macbride*, no. 4169 (TYPE, Field Mus., phot. and fragm. Gr.). This slightly succulent species somewhat recalls *M. carnosa* Muschler, but differs in having its bractlets equal to the involucre instead of one-half its length, involucral scales obtuse instead of acute, corolla-lobes much longer and throat much shorter, and leaves (triangular rather than rhombic-ovate) remotely cuspidate-dentate. In many of its characters *M. montana* resembles the Brazilian *M. involucrata* Hook. & Arn. but that has firmer unreticulated leaves, broader and obtuse or rounded bractlets, and denser inflorescence.

M. (§ **Corymbosae**) **pastazae**, spec. nov., volubilis ut videtur herbacea verisimiliter perennis (basi ignota); caulibus saltim ramis hexagonis ca. 2 mm. crassis post exsiccationem costulatis; internodiis plerisque 5–12 cm. longis; foliis oppositis ovatis integris acuminatis basi gradatim vel abruptius angustatis vel subrotundatis et ad insertionem petioli breviter acuminatis usque ad 8 cm. longis et 4 cm. latis paullo supra basin 3-nervatis utrinque glabris membranaceis; petiolis ca. 2 cm. longis supra canaliculatis, eis ejusdem jugi ab linea paullo prominenti conjunctis; corymbis numerosis oppositis pedunculatis 6–12 cm. diametro planiusculis vel convexis vel valde rotunda-

tis apicem caulis versus inflorescentiam magnam compositam foliaceo-bracteatam formantibus; ramulis ultimis et pedicellis sordide puberulis; capitulis ca. 1 cm. longis 5 mm. diametro sessilibus vel breviter pedicellatis; bracteolis ovatis acuminatis 3-nerviis ca. 6 mm. longis 3 mm. latis; involucri squamis anguste lanceolato-oblongis subacutis ca. 8.5 mm. longis et 2 mm. latis dorso tenuiter striato-costulatis glabris apicem versus paullo patentibus; corollis glabris albis; tubo proprio 2.5 mm. longo gracili; faucibus campanulatis ca. 1–1.2 mm. altis; dentibus limbi ovatis ca. 1.7 mm. longis; achaeniis glabris griseis vel olivaceis vel brunnescentibus ca. 3 mm. longis deorsum decrescentibus; pappi setis sordide albidis ca. 80 capillaribus apicem versus non incrassatis sublaevibus.—ECUADOR: Province Tungurahua; Valley of Pastaza River between Baños and Cashurco, 8 hours east of Baños, alt. 1300–1800 m., Sept. 25, 1923, *Prof. A. S. Hitchcock*, no. 21,875 (TYPE, Gr.).

M. PUNCTATA Klatt. Bull. Soc. Bot. Belg. xxxi. 195 (1893). This species, hitherto known from Southern Mexico to Venezuela and Bolivia, seems never to have been recorded from Peru. It has now been found by Mr. Macbride at two Peruvian stations, namely La Merced, on a sandy valley floor, alt. about 610 m., Aug. 10–24, 1923, no. 5461 (Field Mus., Gr.) and "on sunny shrubs," alt. 1040 m., at Pampayacu, Hacienda at mouth of the Chincao River, July 19–25, 1923, no. 5062 (Field Mus., Gr.); also in less characteristic form as a liana on trees of open wood at about 1220 m., Rio Huallago Cañon below Rio Santo Domingo, June 3, 1923, no. 4219 (Field Mus., Gr.). The last mentioned specimen, while agreeing with the species in important features, has leaves rounded rather than cordate at base and obtusely angled rather than lobed laterally. It appears, however, to be only a leaf-variant. Indeed the leaves are chiefly those in or very near the inflorescence and similar though smaller floral leaves may be sometimes found on the more northern material of the species.

M. (§ **Thyrsigerae**) **rivularis**, spec. nov., fruticosa vel vix lignescens scandens glabra; caulibus teretibus fusco-brunneis post exsiccationem multicostulatis; internodiis 9–17 cm. longis; foliis oppositis oblongis longe acuminatis integerrimis margine revolutis basi acutis utrinque glabris subtus paullo pallidioribus minute papillosis supra basin 3-nervatis (cum venis 2 obscuris intra-marginalibus) 9–11 cm. longis 3–4 cm. latis membranaceis; petiolo 1–2.2 cm. longo; paniculis axillaribus et terminalibus oppositirameis foliaceo-bracteatis; capitulis ca. 9 mm. longis in glomerulis globularibus ca. 3 cm. diametro dispositis, capite terminali arcte sessili, lateralibus distincte pedicellatis pedicellis 1–3 mm. longis; bracteolis ovato-lanceolatis acuminatis

2.5 mm. longis ca. 0.9 mm. latis; involucri squamis ovato-oblongis apice rotundatis ciliolatis ca. 4.8 mm. longis 1.2 mm. latis dorso glabris leviter costulatis; corollis ca. 6 mm. longis glabris; tubo proprio 2.5 mm. longo; faucibus cylindratis vix ampliatis 3 mm. longis; dentibus limbi acutis deltoideis patentibus 0.5 mm. longis; achaeniis maturis 2 mm. longis crassiusculis argute angulatis griseo-olivaceis glaberrimis lucidis; pappi setis rubellis ca. 45 apice paullo incrassatis obtusis penicillatis.—PERU: liana-like, on stream-brush; flowers white, turning greenish, about 610 m. alt., Aug. 10–24, 1923, *J. F. Macbride*, no. 5414 (TYPE, Field Mus.; ISOTYPE, Gr.).

This species in foliage has some resemblance to *M. Stuebelii* Hieron. but that has a different inflorescence (the lateral as well as the terminal heads being subsessile), longer and pubescent achenes, less blunt pappus-setae and other differences.

II. NEW PLANTS OF PORTUGUESE WEST AFRICA COLLECTED BY MRS. RICHARD C. CURTIS.

BY I. M. JOHNSTON.

THE species here described are a part of an excellently prepared and very interesting collection of African plants made by Mrs. Richard C. Curtis, of Boston, during the summer of 1923, when accompanying her husband as well as his father, Mr. Charles P. Curtis, and brother, Mr. Charles P. Curtis, Jr., on a hunting trip to the interior of Kenya Colony and Angola. The plants are not only carefully chosen and well preserved, but are accompanied by full ecological, habital and color notes. Hence they form a most welcome addition to the meager representation of the tropical African flora available in America.

The most interesting of the plants collected by Mrs. Curtis were those secured in central Angola, for here the expedition pene-trated a region which appears to have been previously unexplored botanically. A considerable part of the Angola collection was made in the range of the Giant Sable Antelope, between the Cuanza and Loando Rivers, about 100 miles south of their confluence. The party started from Dondé or Bella Vista, in Bailundo, near the end of the railroad east of Angola Bay, from there going by auto northwestward 120 miles to Capango. The march towards the Sabel Country started September 11th; the Cuanza River was crossed on the 14th, and a hunting camp formed on the 15th. The return march began September 22nd, and Capango was reached on the 26th,

the Cuanza having been crossed on the 24th. The Angola collection includes 311 numbers and was given by Mrs. Curtis to the Gray Herbarium. The Kenya collection is not as yet fully identified. So far as studied, it seems likely to contain many plants not previously represented in American herbaria, but relatively few, if any, that have not been scientifically described. Of the Kenya collection the ligneous plants have been deposited in the herbarium of the Arnold Arboretum and the herbaceous material, amounting to some 442 numbers, in the Gray Herbarium. Mrs. Curtis also made for the Gray Herbarium small collections during brief stops at Zanzibar, Mozambique, Lorenzo Marques, Walfisch Bay and Lüderitz Bay, containing characteristic plants of these localities.

Acrospira Curtisiae, sp. nov., glabra herbacea 20–24 cm. alta e cormo obliquo depresso 15–25 mm. crasso rugoso squamoso apicem versus radiculoso producta; foliis 3–5 linearibus nervosis 4–5 mm. latis; pedunculo foliis destituto gracili sulcato infra flores 13–15 cm. longo; racemo 8–10-floro simplici stricto 10–15 mm. crasso bracteis ovatis acuminatis scariosis instructo; floribus albis vel ochroleucis stricte et 2–6 mm. longe pedicellatis; perianthii lobis lanceolatis acutis ca. 10–11 mm. longis, exterioribus ca. 3 mm. latis in carina 3-nervatis; staminibus 6 subaequalibus, filamentis albis ca. 5 mm. longis linearibus, antheris luteis linearibus introrsis 4–4.5 mm. longis basifixis spiraliter convolutis basi profunde cordatis; capsula ovoidea lobata glabra 4–5 mm. crassa trivalva loculicide dehiscenti transverse delicateque undulato-rugosis; seminibus multis atris dense minute acuminate muriculatis irregulariter lobulatis ca. 2 mm. latis.—ANGOLA: east of the Cuanza River, Sept. 23, 1923, *Anita G. Curtis 333* (TYPE, Gray Herb.).—*Acrospira Curtisiae* differs from *A. asphodeloides* Welw., the other Angolan species, in its much smaller size, very much narrower leaves, and longer filaments; from *A. Laurentii* DeWild., of the Belgian Congo, it differs in lack of pubescence, narrow leaves, and much less developed bracts; while from *A. lilioides* Chev., of French Equatorial Africa, it may be readily distinguished by its narrower leaves and narrower lanceolate perianth-lobes. The plant has a depressed oblique corm with dark wrinkled and scarred surface bearing over the upper portion numerous fleshy, often fusiform, rootlets.

Brachystegia Russelliae, sp. nov., suffruticosa; caulibus pluribus rhizomate crassissimo lignoso erumpentibus 3–4 dm. altis subsimplicibus glaberrimis basi squamis imbricatis instructis; foliis paucis imparipinnatis 12–18 cm. longis 4–5 cm. latis glaberrimis 9–12-jugis 1.5–2 cm. longe petiolatis; foliolis coriaceis oppositis subsessilibus

glaberrimis oblongo-lanceolatis 6–11 mm. separatis 3–4.5 mm. longis 8–10 mm. latis superioribus paullo gradatim reductis apice obtuse rotundatis basi oblique truncatis vel subcordatis subtus paullo pallidioribus costa paullo excentrica; stipulis deciduis inconspicuis reniformi-deltoideis 3–4 mm. latis venosis; inflorescentia pauce laxeque ramosa 3–6 cm. longa ca. 3 cm. crassa fulvo-tomentulosa folio multo breviori; bracteis ovatis vel oblongo-ovatis 2–3 mm. longis deciduis, pedicellis 2–4 mm. longis tomentulosis; bracteolis obovatis ca. 6 mm. longis 4–4.5 mm. latis coriaceis extus tomentulosis apice rotundatis; sepalis 5 inaequalibus imbricatis oblongis vel ovatis 2–3 mm. longis 1–1.5 mm. latis pallidis conspicue dense fusco-ciliatis; petalis 3–5 inaequalibus filiformi-subulatis 0.5–1.5 mm. longis pallidis; staminibus 10–15 ca. 10–12 mm. longis glabris; ovario dense villoso ca. 2 mm. longe stipitato; legumine ignoto.—Angola: locality uncertain, but probably from the Sable Country, *Anita G. Curtis 428* (type, Gray Herb.).—This remarkable species is an undershrub with annual shoots from a woody rootstock and in that regard resembles the common habit of *Cryptosepalum*. In floral structures, however, the new species is clearly typical of *Brachystegia*, and I see no good reason for not considering it a member of that genus. It is noted that Burtt Davy & Hutchinson, Kew Bull. 1923, 130, in their recent revision of *Brachystegia* recorded no species with such a habit. Arborescent plants and undershrubs are accommodated, however, in the closely related *Cryptosepalum*. In the revision referred to, *B. Russelliae* keys out with *B. longifolia* Benth. of Nyasaland, a species which differs in its loosely branched arborescent habit, larger leaves, narrower bracteoles and sepals, and more stipitate, less villous ovary. Fig. 4.

At the request of Messrs. C. P. and R. C. Curtis this plant has been named in memory of the late Margaret P. (Mrs. Robert S.) Russell of Boston at whose suggestion the botanical collecting of the expedition was undertaken.

Cryptosepalum Curtisiorum, sp. nov., humilis; caulibus multis erectis simplicibus gracilibus e rhizomate crassissimo lignoso erumpentibus dense puberulentis fuscis 1–2 dm. altis basi a squamis latis scariosis instructis; foliis imparipinnatis breviter petiolatis 14–20-jugis 4–5(–9) cm. longis 15–25 mm. latis oblongis vel rare ovatis; rhachi puberulenta; foliolis subsessilibus oblongis vel lineari-oblongis 10–18 mm. longis 2–3(–4) mm. latis glaberrimis margine integerrimis et sparse ciliatis apice rotundatis vel obtusis basi obliquis; stipulis lanceo-linearibus scariosis 9–14 mm. longis libris; racemis terminalibus 10–25-floris 4–6 cm. longis 20–25 mm. crassis puberulentis, bracteis

obovato-oblanceolatis scariosis, pedicellis strictis 8–15 mm. longis; bracteolis petaloideis albis obovatis 5–8 mm. longis apice rotundatis extus puberulentis; petalo 1 oblongo vel obovato 5–8 mm. longo albo; staminibus 3 glabris; ovario compresso stipitato in lateribus glabro in marginibus plus minusve dense ciliato; legumine stipitato valde obliquo plano oblongo vel ovato 2–3 cm. longo glabro in margini superiori angustissime bialato.— ANGOLA: dry hard soil near Cuanza River, Sept. 13, 1923, *Anita G. Curtis 186* (TYPE, Gray Herb.); Giant Sable Country, east of Cuanza River, 900 m. alt., *Anita G. Curtis 207, 212, 271a, 281, 290.*—Closely related to *C. mimosoides* Welw., but readily distinguished by its more numerous flowers, better developed inflorescence, and much longer pedicels. This species is named in honor of Messrs. Charles P. Curtis and Richard C. Curtis, whose careful planning and skillful direction of their difficult journey into the interior of Angola rendered possible the discovery of the plants here described. It is learned that *Cryptosepalum Curtisiorum* is one of the plants chiefly grazed by the Giant Sable Antelope. FIG. 3.

Crotalaria bicolor, sp. nov., perennis; caulibus numerosis subsimplicibus strictis 15–25 cm. altis minute sulcato-striatis breviter villosis canescentibus e radice crassa orientibus; stipulis nullis; foliis trifoliolatis 2–5 mm. longe petiolatis, inferioribus gradatim reductis; foliolis lineari-oblanceolatis acutis, brevissime petiolulatis supra glabris subtus strigose pubescentibus, terminali 8–16 mm. longo 0.7–2.0 mm. lato; racemis terminalibus densiusculis 4–8 cm. longis 10–13 mm. crassis basem versus cum foliis normalibus bracteatis aliter minute setaceo-bracteatis; pedicellis ca. 3 mm. longis ascendentibus; calycibus 3–5 mm. longis, dentibus lanceolatis tubum excedentibus; corolla calycem fere duplo superante; carina flava 5–6 mm. longa margine inferiori rectangulari-inflexa inde in rostrum rectum attenuata; vexillo sparse pubescenti rubro-brunnescenti-lineato 5–6 mm. longo; ala flava brunnescenti-lineata; leguminibus obliqui-depresse globosis sessilibus erecto-pedicellatis 3–4 mm. longis monospermis sparse adpressi-pubescentibus.—ANGOLA: just east of Cuanza River, alt. 900 m., Sept. 18, 1923, *Anita G. Curtis 211* (TYPE, Gray Herb.), Giant Sable Country, alt. 900 m., Sept. 21, 1923, *Anita G. Curtis 252.*—Apparently related to *C. erythrophleba* Welw., but having smaller flowers with both standard and wings streaked with purple or reddish brown, more numerously flowered inflorescence leafy-bracted only at very base, inconspicuously pubescent larger leaves, and lower decidedly perennial habit. The plant has a strong, thick, deep taproot which distinguishes it from most of the other members of the

§ *Sphaerocarpae.* The keel and standard of the corolla are subequal. The keel is yellow, and the standard and wings are yellow with many longitudinal brownish-purplish lines. FIG. 2.

Indigofera latipinna, sp. nov., fruticosa erecta; caulibus pluribus ca. 4 dm. altis lignosis teretibus maturitate dilute brunnescentibus glabris basem versus 6 mm. crassis juventate adpresse villosis canescentibus; petiolis ca. 1 ca. longis canescenti-villosis; foliis imparipinnatis in rhachi breviter villosis canescentibus, primariis trifoliolatis ceteris quinque-foliolatis; foliolis integerrimis cuneato-obovatis 10–25 mm. longis 7–16 mm. latis ca. 1 mm. longe petiolulatis bicoloribus supra glaberrimis subtus dense canescenter tomentosis basi cuneatis apice truncatis vel late obcordatis vel retusis conspicue mucronatis, lateralibus oppositis, terminalibus paullo minoribus; stipulis lineari-lanceolatis 5–6 mm. longis deciduis; racemis 5–7 cm. longis axillaribus multifloris ascendibus quam folia paullo brevioribus vel ea paullo excedentibus; rhachi et pedicellis et calyce canescentibus adpresse villosis; floribus 0.5–1.0 mm. longe pedicellatis; calycis 1.5 mm. longi obliqui tubo brevi, dentibus obtusis deltoideis vel late ovatis; corolla calycem fere quadruplo superante ca. 12 mm. longa flavescenti vel ochroleuca; vexillo 9 mm. longo elliptico plicato apice rotundato brevissime unguiculato extus adpresse sparseque fusco-pubescenti quam carina multo breviori; alis lineari-oblongis ca. 8 mm. longis; carina 11–12 mm. longa acuta (in rostrum non producta); legumine ignoto.—ANGOLA: near Cuanza River, a day's march from Copango, Sept. 24, 1923, *Anita G. Curtis 360* (TYPE, Gray Herb.).—A member of Baker's group *Tinctoriae*, Jour. Bot. xxxii. 263 (1903), in which it is readily distinguished from most of the species by its woody stems and particularly by its few very large conspicuously bicolored leaflets. It is most nearly related to *I. rhynchocarpa* Welw. and *I. nambalensis* Harms, but differs from both in the number, size, outline and pubescence of the leaflets.

Aeschynomene Curtisiae, sp. nov., perennis herbacea ca. 4 dm. alta; caulibus erectis striatis paullo angulatis crasse sparseque hispido-setulosis stricte ramosis; stipulis lanceolatis acuminatis coriaceis paralleliter nervatis basi truncatis; foliis paucis strictis 10–12 mm. longe petiolatis 4–9 cm. longis ca. 1.7 cm. latis; rhachi compressa angulata glabrata; foliolis 8–20 oppositis vel rariter alternis coriaceis valde nervatis glabris 0.5–1.0 mm. longe petiolulatis oblongis vel elliptico-oblongis 15–20 mm. longis 4–6 mm. latis integerrimis apice rotundatis conspicue mucronatis basi obliquis subcordatis; panicula terminali laxa ca. 15 cm. crassa; pedicellis ascendentibus glabris 5–10 mm. longis; calycis glaberrimi 5 mm. longi labio superiori profunde

(ca. 1 mm.) emarginato 3–3.5 mm. lato ovato, labio inferiori integerrimo ca. 3 mm. lato obtuso; vexillo oblongo ca. 1 mm. longe unguiculatis, lamina 5 mm. longa 2 mm. lata flavescenti conspicue purpureo-nervata apice rotundata carinam subaequanti; alis flavis oblongo-lanceolatis acutis ca. 6–7 mm. longis 2 mm. latis 1 mm. longe unguiculatis quam petala cetera longioribus; carina 2.5 mm. lata flavescenti purpureo-nervata; ovario glabro stipitato 2-ovulato; legumine glabro valde compresso venoso saepe 2-loculato 10–14 mm. longe stipitato; loculis 7–9 mm. latis 10–14 mm. longis ca. 0.7 mm. crassis marginatis sed non alatis.—ANGOLA: Giant Sable Country, 900 m. alt., Sept. 23, 1923, *Anita G. Curtis 321* (TYPE, Gray Herb.).—Apparently most nearly related to *A. Baumii* Harms but glandless, much less pubescent, and with a lower herbaceous habit, entire lower calyx-lip, smaller flowers, and wingless pods. It is probably also related to *A. siifolia* Welw., but that has more pubescence and has many more leaflets. The new species is a handsome one because of its firm clean yellowish-green seemingly glabrous herbage, and loose panicles of small yellowish or ochroleucous flowers and later large conspicuously stipitate broad glabrous fruit. FIG. 1.

Dolichos linearifolius, sp. nov. perennis erectus 30–45 cm. altus; caulibus paucis herbaceis in sicco angulatis et striatis simplicibus vel ascendenter ramosis pallide viridibus sparse adpresseque villosis e radice crassa lignosa conico-fusiformi orientibus; stipulis triangulari-oblongis sessilibus glabris striatis subpersistentibus 4–5 mm. longis 2–4 mm. latis; foliis pinnatim trifoliolatis 8–16 mm. longe petiolatis, foliolis linearibus longitudinaliter trinerviis ca. 1 mm. longe petiolulatis basi cuneatis apice acutis juventate dense argenteo-villosis maturitate glabratis terminalibus usque ad 5 cm. longis et 6 mm. latis; inflorescentia ante folia evoluta vel cum foliis novellis vel nondum plane evolutis coaetanea; floribus 5–7 mm. longe pedicellatis in axillis bractearum vel foliorum fasciculatis; calyce campanulato sparse villoso 4–5 mm. longo irregulari, dentibus brevibus 2 superioribus in unum excisum connatis, lateralibus lanceolato-ovatis acutis, infimo ceteris paullo longiori lanceolato acuto tubo breviori; prophyllis 2 infra calycem insertis filiformibus 2–3 mm. longis; corolla glabrata 7–9 mm. longa (in sicco lilacea) calyce pluries longiori; vexillo suborbiculari emarginato ca. 1 mm. longe unguiculato 9–10 mm. lato; alis carinam paullo excedentibus oblique ca. 8 mm. longis; carina curvata obtusa ca. 3 mm. longe unguiculata, laminis 6 mm. longis; ovario lineari-lanceolato supra basin dilatato apicem versus attenuato apice 3–4 cm. longo ca. 8 mm. lato compressissimo.—ANGOLA: Between Cuanza and Loando Rivers, alt. ca. 900 m., Sept.

19–22, 1923, *Anita G. Curtis 230* (TYPE, Gray Herb.), *216, 288.*—This species belongs to Harms's § *Trinervati* and appears to be most nearly related to *D. trinervis* De Wild. of Katanga. It differs, however, in being less pubescent and in having short calyx-lobes that do not surpass the length of the calyx-tube. FIG. 8.

Polygala congestiflora, sp. nov., annua herbacea; caule erecto striato in sicco atrato puberulo 4 dm. alto, ramis numerosis 10–15 cm. longis ascendentibus subsimplicibus angulatis floriferis; foliis numerosis oblanceolatis firmis integerrimis uninerviis glabratis concoloribus 1.5–2 cm. longis 3–4 mm. latis in sicco atropurpurascentibus apice breviter acuminatis basi attenuatis, racemis congestis subglobosis terminalibus 15 mm. crassis; bracteis ovato-deltoideis carinatis minutis deciduis; pedicellis angulatis 1–4 mm. longis; sepalo superiori ovato acuto 3-nervato 3 mm. longo glabro margine breviter denseque ciliato; sepalis anterioribus oblongis acutis ciliatis 3-nervatis glabris supra medium connatis 2.5 mm. longis; alis oblique ovatis ca. 8 mm. longis ca. 5 mm. latis flavis glabris basi abrupte lato-unguiculatis apice acutis margine basin versus inconspicue ciliatis; carina flavescenti 6 mm. longa ampla abrupte 1 mm. longe unguiculata; cristis plurifidis ca. 2 mm. longis; petalis superioribus oblongis ca. 3.5 mm. longis apice retusis basin versus abrupte breviter unguiculatis; antheris 6 oblongis glabris quam filamenta 4–6-plo brevioribus; filamentis glabris duobus interioribus sterilibus; stylo curvato glabro ca. 5 mm. longo apicem versus vaginato abrupte recurvo cucullato; stigmate refracto papilloso; ovario glabro oblongo-elliptico vix alato.—ANGOLA: vicinity of Capango, Sept. 27, 1923, *Anita G. Curtis 419* (TYPE, Gray Herb.).—A well marked species belonging in the "Subsect. *Deltoidea* § *Tetrasepala*" of Chodat. Its closest relation appears to be *P. Dekindtii* Gürke, from which it differs in its broader leaves, larger decidedly acute wings and oblong upper petals. Its style is almost exactly like that of *P. liniflora* Boj. and *P. acicularis* Oliv. as they are illustrated by Chodat, Monog. Polygal. t. 29, fig. 2 & 8 (1893). FIG. 5.

Triumfetta glabrata, sp. nov., herbacea perennis; caulibus numerosis erectis 20–35 cm. altis glabratis gracilibus in basi a squamis latis obtusis ornatis e radice crassa orientibus infra medium foliosis; foliis simplicibus 3–6 cm. longis 1.5–4 mm. latis anguste lanceolato-linearibus denticulatis subsessilibus acutis vel obtusis basin versus attenuatis subtus pallidioribus maturitate glaberrimis vel cum pilis stellatis paucis obtectis juventate canescentibus leviter stellato-tomentosis; stipulis filiformibus deciduis 2–4 mm. longis; inflorescentia terminali paniculata ascendenter pauciramosa supra folia valde projecta ca.

15 cm. longa 5 cm. crassa; floribus in cymas plurifloras distantes aggregatis; pedicellis 3–7 mm. longis pubescentibus; sepalis ca. 7 mm. longis late oblanceolato-linearibus ca. 1.5 mm. latis extus stellato-tomentulosis intus glabris 5–7-nervis supra basin reflexis, cornu 0.3–0.5 mm. longo; petalis obovatis 5–6 mm. longis apice rotundatis basi late unguiculatis; staminibus 25–35; disco et ovario villosis; fructibus ignotis.—ANGOLA: east of Cuanza River, Sept. 20, 1923, *Anita G. Curtis 231* (TYPE, Gray Herb.).—Obviously related to *T. Welwitschii* Masters from which it is distinguishable by its lack of pubescence, inconspicuous stipules, and smaller leaves and flowers.

Ochna angolensis, sp. nov., fruticula 1–5 dm. alta glaberrima e radice crassa lignosa oriens; caulibus pluribus 1–2 mm. crassis subsimplicibus erectis; foliis subcoriaceis oblongo-oblanceolatis vel oblanceolatis integerrimis vel apicem versus parcissime obsoleteque serrulatis 5–8 cm. longis 12–24 mm. latis 2–4 mm. longe petiolatis apice obtusis mucronatis basi cuneatis, nervis lateralibus majoribus 18–24 angulo acuto in costa insidentibus, venis numerosis in costa subrectangulariter impositis atque a nervis transversis reticulatis, nervis venisque supra prominulentibus; stipulis deciduis lineari-lanceolatis 3–5 mm. longis; floribus flavis in pseudoracemos 4–7-floros laxos 2–6 cm. longos 2.5–5 cm. crassos 2–5 mm. longe pedunculatos axillares dispositis; racemis conjunctim inflorescentiam complexam laxiusculam multifloram 2.5–4.5 cm. crassam formantibus; pedicellis 5–8 mm. longis; pedunculis unifloris 3–5 mm. longis; bracteis inconspicuis deciduis subulatis 1–3 mm. longis; sepalis obovatis apice rotundatis petalis aurantiaco-flavis oblonge obovatis 9–14 mm. longis; staminibus 25–35 quam petala brevioribus; filamentis filiformibus 3–4 mm. longis quam antherae 2–3-plo longioribus; antheris linearioblongis longitudinaliter dehiscentibus; ovario 5-lobo glabro.—ANGOLA: Dondé, Bailundo, ca. 1500 m. alt., Sept. 8, 1923, *Anita G. Curtis 158* (TYPE, Gray Herb.), *136;* dry, hard soil at Cuanza River, Sept. 13, 1923, *Anita G. Curtis 171;* west bank of Cuanza River, Sept. 25, 1923, *Anita G. Curtis 372.*—Related to *O. Debeerstii* De Wild., which also occurs in Angola, but differing in its broader, larger, obtuse, subentire leaves and larger, more floriferous racemes of distinctly larger flowers. Oil obtained from the leaves of the plant is said to be used in ointments.

Symphostemon articulatus, sp. nov., glaberrimus herbaceus verisimiliter annuus; caule erecto gracili laxe et ascendenter alterni-ramoso subtereti ca. 35 mm. alto infra medium sparse alternifolia; ramis ramulisque a bracteis lanceolatis caducis 2–3 mm. longis suffultis; foliis non visis ut videtur caducis saltim ab exemplis Dominae

Curtisiae deficientibus; inflorescentia racemosa terminali laxa 10–15 cm. longa 2–3 cm. crassa; pedicellis laxe ascendentibus 8–10 mm. longis a bracteis minutis deciduis suffultis medium versus articulatis, parte superiori fusce et sparse stellato-setulosa decidua, parte inferiori persistenti glabrata; calyce campanulato extus glandulifero fructifero 6–7 mm. longo ca. 3.5 mm. crasso; lobo superiori late ovato breviori; lobis inferioribus anguste triangularibus acutis; corolla alba vel dilute rosea calyce 4–5-plo longiori glabra extus glandulifera, tubo cylindrico supra basem abaxillariter valde gibboso ca. 4 mm. longo 1.5–2 mm. crasso, faucibus late campanulatis ca. 4–5 mm. longis 3–4 mm. crassis, labio inferiori ca. 10 mm. longo ovato ca. 8 mm. lato obtuso, lobis labii superioris 4, exterioribus suborbicularibus 2 mm. longis, interioribus oblongo-ovatis ca. 1.1 mm. longis inconspicuis ab exterioribus imbricatis obscuratis; filamentis linearibus ca. 8 mm. longis basem versus ca. 1.5 mm. longe connatis; nuculis globosis ca. 1.8 mm. crassis rubescentibus subopacis sublaevibus.—ANGOLA: east of the Cuanza River, Sept. 23, 1923, *Anita G. Curtis 309* (TYPE, Gray Herb.).—Differing from *S. insolitus* (Wright) Hieron. in its larger and differently proportioned, decidedly sigmoid, pale corollas which have a well developed proper tube and proportionately smaller upper lip. In *S. articulatus* the outer pair of lobes on the upper lip are much the largest, being roughly orbicular in outline and surpassing the oblong-ovate inner lobes, as well as strongly overlapping and somewhat hiding them. The peduncles of the reduced racemose panicles bear only a single flower apiece, and hence the pedicel appears about twice its real length and is apparently articulate near its middle. Upon maturing the pedicel and calyx fall away leaving the rhachis of the inflorescence beset with the persistent peduncles. FIG. 7.

Ocimum cuanzae, sp. nov., perenne herbaceum 2.5–4 dm. altum; caulibus pluribus pauce stricteque ramosis tetragonis sulcatis albide septateque hispido-villosis; foliis firmis lanceolatis vel oblongo-lanceolatis 4–11 cm. longis 1.5–3.5 cm. latis glaberrimis vel sparsissime villosis minute impresso-glandulosis apice rotundato-obtusis basi abrupte attenuatis subtus pallidis flavescenti-glaucis conspicue nervatis margine grossidentatis ciliatis; petiolis 10–13 mm. longis sparse villosis; racemis multifloris 3–8 cm. longis 10–15 mm. crassis 1–3.5 cm. longe pedunculatis terminalibus vel axillaribus, verticellastris 4–5-floris; pedicellis 1–4 mm. longis dense villosis; calyce villoso purpurascenti nutanti, tubo campanulato fructifero 5–6 mm. longo, dente superiori ovato-orbiculari acuminato decurrenti, dentibus lateralibus triangulari-ovatis longissime acuminatis, dentibus inferioribus subulatis elongatis; corolla 10–12 mm. longa extus pubes-

centi, tubo calycem floriferum aequanti 5–6 mm. longo, labiis tubo brevioribus extus pallide glanduliferis pubescentibus, inferiori oblongo-lanceolato ca. 5 mm. longo apice bilobato, lobulis ca. 1 mm. longis oblongo-ovatis, labio superiori subrectangulari 2.5 mm. longo et lato apice ca. 1 mm. profunde trilobatis, lobulis ovatis; staminibus 4 inclusis, filamentis exappendiculatis glabris 2 mm. longis linearibus. —ANGOLA: near the Cuanza River, Sept. 24, 1923, *Anita G. Curtis 342* (TYPE, Gray Herb.), *343*.—Belonging to the § *Gymnocimum* and apparently most nearly related to *O. laxiflorum* Baker, from which, to judge from descriptions, it differs in its larger, more elongate, firm, dentate leaves, and less open inflorescence. FIG. 6.

Among the ferns collected by Mrs. Curtis and determined at the Gray Herbarium by Mr. C. A. Weatherby one appears to require a new combination of names to designate it in accordance with the International Rules of Botanical Nomenclature. At Mr. Weatherby's request this nomenclatorial change with explanatory synonymy may be here placed on record as follows:

THELYPTERIS PALUSTRIS Schott, var. **squamigera** (Schlecht.) Weatherby, n. comb. *Aspidium Thelypteris β. squamigerum* Schlecht. Adumb. 23, pl. 11 (1825). *A. squamulosum* Kaulf. ex Schlecht. l. c. (in synonymy). *Lastrea squamulosa* Presl, Tent. 76 (1836). *Nephrodium squamulosum* Hook. f. Fl. New Zealand, ii. 39 (1855). *A. Thelypteris β. squamuligerum* Mett. Abh. Senckenb. Naturf. Ges. ii. 112 (1858). *N. Thelypteris β. squamulosum* Hook. Sp. Fil. iv. 88 (1862). *N. Thelypteris*, var. *β. squamuligerum* Sim, Ferns S. Africa, 180 (1892). *Dryopteris Thelypteris*, var. *β. squamuligerum* [sic] Sim, Ferns South Africa, ed. 2, 102 (1915).

EXPLANATION OF PLATES.

PLATE 1. Fig. 1. *Aeschynomene Curtisiae* Johnston, n. sp. × ½; 1a. lower surface of leaf of same × 1. Fig. 2. *Crotalaria bicolor* Johnston, n. sp. × ½; 2a. mature legume of same × 2. Fig. 3. *Cryptosepalum Curtisiorum* Johnston, n. sp. × ½; 3a. petal × 1, 3b. submature pod × ½, 3c. flower after removal of bracteoles, petal, and 2 stamens × 2. Fig. 4. *Brachystegia Russelliae* Johnston, n. sp. × ½; 4a. flower after removal of bracteoles × 2; 4b. bracteole × 1½; 4c. leaf × 1.

PLATE 2. Fig. 5. *Polygala congestiflora* Johnston, n. sp. × ½; 4a. wing × 1. Fig. 6. *Ocimum cuanzae* Johnston, n. sp. × ½; 6a. a large leaf × ½; 6b. fruiting calyx × 1. Fig. 7. *Symphostemon articulatus* Johnston, n. sp. × ½; 7a. side view of flower × 1. Fig. 8. *Dolichos linearifolius* Johnston, n. sp., in very immature foliage × ½.

A. Brackett del.

1. AESCHYNOMENE CURTISIAE Johnston, spec. nov.
2. CROTALARIA BICOLOR Johnston, spec. nov.
3. CRYPTOSEPALUM CURTISIORUM Johnston, spec. nov.
4. BRACHYSTEGIA RUSSELLIAE Johnston, spec. nov.

A. Brackett del.

5. POLYGALA CONGESTIFLORA Johnston, spec. nov.
6. OCIMUM CUANZAE Johnston, spec. nov.
7. SYMPHOSTEMON ARTICULATUS Johnston, spec. nov.
8. DOLICHOS LINEARIFOLIUS Johnston, spec. nov.

III. ON SOME SOUTH AMERICAN PROTEACEAE.

By I. M. Johnston.

Euplassa occidentalis, sp. nov., arborea; ramis juventatis ferrugineo-tomentulosis solidis alternis lignosis; foliis abrupte pinnatis alternis 30–35 cm. longis 13–15 cm. latis patenti-erectis 4-jugis; petiolis cum rhachibus 20–23 cm. longis minute ferrugineo-velutinis striatis; foliolis oppositis vel alternis breviter petiolulatis obovatis vel obovato-oblongis 6–15 cm. longis 35–70 mm. latis obtusis integerrimis glabratis venosis bicoloribus supra nitidis subtus opacis, superioribus oppositis majoribus; stipulis nullis; racemis 15–20 cm. longis 3–3.5 cm. crassis quam foliae brevioribus dense strigosis in axillis superioribus solitariis; floribus albis geminatis patenter 4–5 mm. longe pedunculatis 1–3 mm. longe pedicellatis; alabastris rectis cylindricis 10–12 mm. longis basem versus dilatatis apicem versus axillariter gibbosis strigoso-canescentibus; sepalis 4 inaequalibus lineari-spathulatis intus glabris apicem versus abrupte acute subcucullate ovato-dilatatis; antheris subsessilibus ovato-oblongis acutis bilocularibus albis; ovario glabro vel sparsissime villoso; stylo glabro apicem versus compresso-dilatato; stigmate laterali rubescenti oblongo; glandulis 4 carnosis depresso-orbicularibus glabris; fructibus ignotis.—Ecuador: gold mine near Zaruma, between Portovelo and El Tambo, Prov. Oro, alt. 600–1000 m., Sept. 2, 1923, *Hitchcock, 21,311* (type, Gray Herb.).—Apparently most nearly related to *E. inaequalis* (Pohl) Engler, of eastern Brazil, from which it is readily distinguished by its well developed peduncles, straight style, longer and more distinctly lateral pubescent stigma, less pubescent longer sepals, and 4-jugate leaflets. It is the first species to be reported from west of the Andes and the only one outside of Brazil and Guiana.

Euplassa bahiensis (Meisn.), comb. nov. *Adenostephanus bahiensis* Meisn. in Mart. Fl. Brasil. v. pt. 1, 94 (1855).

Euplassa incana (Klotzsch), comb. nov. *Adenostephanus incana* Klotzsch, Linnaea xv. 52 (1841).

Euplassa laxiflora (Meisn.), comb. nov. *Adenostephanus laxiflora* Meisn. in Mart. Fl. Brasil. v. pt. 1, 94 (1855).

Euplassa legalis (Vell.), comb. nov. *Dicneckeria legalis* Vell. Fl. Flum. 41 (1825); Icones i. 105 (1827). *Adenostephanus Sellowii* Klotzsch, Linnaea xv. 52 (1841).

Euplassa nitida (Meisn.), comb. nov. *Adenostephanus nitida* Meisn. in Mart. Fl. Brasil. v. pt. 1, 94 (1855).

Euplassa organensis (Gard.), comb. nov. *Rhopala organensis* Gard. in Hook. London Jour. Bot. iv. 135 (1845).

Euplassa pinnata (Lam.), comb. nov. *Roupala pinnata* Lam. Encyc., Tab. i. 243 (1791). *E. meridionalis* Salisb. in Knight, Prot. 101 (1809). *Adenostephanus guyanensis* Meisn. in Mart. Fl. Brasil. v. pt. 1, 95 (1855).

Roupala monosperma (R. & P.), comb. nov. *Embothrium monospermum* R. & P. Fl. Peruv. i. 63, t. 98 (1798). *R. peruviana* R. Br. Trans. Linn. Soc. ser. 1, x. 192 (1811).

IV. STUDIES IN THE BORAGINACEAE.—III.

By Ivan M. Johnston.

1. The Old World Genera of the Boraginoideae.

With the object of furnishing substantial foundation for phylogenetic speculations concerning the American eritrichioid borages, a study was recently undertaken of the Asiatic genera of the tribe *Eritrichieae*. This raised so many doubts concerning the naturalness of the currently accepted classification of the tribe, that it was finally found advisable to review all the Old World genera of the subfamily *Boraginoideae* in order that certain peculiar genera might be satisfactorily placed tribally. The results of this study of generic and tribal lines, consisting of new generic keys, generic bibliography, and various systematic and taxonomic notes, are presented in this paper. The work was done wholly in the library and upon the rich boraginaceous collections of the Gray Herbarium. Through the courtesy of Dr. W. R. Maxon, however, I have had the privilege of studying certain very helpful material contained in the United States National Herbarium.

The system of tribal classification suggested in this paper finds its justification in the observation, that from the *Lithospermeae*, through the *Eritrichieae*, to the *Cynoglosseae* there is a group of roughly concomitant morphological trends. The most evident of these is for the nutlets to shift from a basal or abradicular attachment, through a lateral one, to an attachment that is apical or adradicular; for the nutlets to change from usually smooth and rounded towards commonly margined and roughened or appendaged; and for the lobed or divided style and two stigmas to tend towards a simple style and solitary stigma. It is also a notable fact that corolla-structures, variable in the *Lithospermeae*, tend to become rather uniform in the *Cynoglosseae*, whereas the nutlets act in directly the opposite manner. The tribe *Anchuseae* is a natural group, appearing to represent an off-shoot from the *Lithospermeae*, and does not seem to belong to the phylogenetic line terminating in the *Cynoglosseae*.

In the past the tribes have been defined entirely upon the basis of nutlet-attachment. Though this has thrown the genera into more or less homogeneous tribes, it has tended to separate from the groups to which they naturally belong such genera as *Bothriospermum*, *Trigonotis*, *Myosotis*, etc., which are aberrant in nutlet-structures, and has made it difficult for those not thoroughly acquainted with the plants to place tribally such genera as *Mertensia*, *Plagiobothrys*, *Antiphytum*, etc., which are more or less ambiguous in the crucial nutlet-characters. In placing the genera in the present system I have tried to balance the number and nature of the structural agreements with those of disagreement, and after grouping the genera in the manner which seems most natural have then tried to discover the character or characters which distinguish or commonly indicate the tribal groups formed. No single character was discovered which would invariably indicate the tribes, since, as is usually the case in such a variable natural group, the component elements, while agreeing in many details, all show the common tendency of departing individually and unexpectedly in one character or another from the condition perhaps otherwise uniform and diagnostic of the group. The chief fault with the current classification results from the lack of recognition of this well known fact. Nutlet-attachment, while diagnostic in the main, appears susceptible to the same aberrancies as the other characters, and it therefore seems advisable to attempt the use of several characters, rather than one, in determining the natural tribal positions of the genera treated. The tribes of the *Boraginoideae* and the Old World genera may be distinguished as follows:—

Lithospermeae.

Nutlets erect, straight (or bent in *Alkanna*), smooth or verrucose, unmargined; areola basal or occasionally suprabasal, near tip of cotyledon, unmargined, flat or nearly so, not at all strophiolate; gynobase flat or low-pyramidal, not excavated; style cleft or entire; stigmas 2 (or 4 in *Arnebia* sp.), distinct or proximate or rarely fused, capitate or obscurely thickened; corolla yellow or orange or occasionally white or somewhat purplish.—As here defined the tribe is in its broadest sense and includes those genera with more or less irregular corollas which have been grouped to form the tribe *Echieae*. The development of zygomorphy furnishes no substantial basis for the recognition of a fifth tribe, for between the conspicuously irregular corollas of certain Echiums, and the regular corollas of typical Lithospermums, there is every intermediate stage of irregularity. *Echium italicum*

has regular or subregular corollas, and in a number of the Echiums of the section *Lobostemon* the corolla is also regular or practically so. Even in the restricted *Lithospermeae* there is a tendency towards zygomorphy. It is slightly developed in *Macromeria*, and more so in *Megacaryon* and *Echiochilon*. On account of its noticeable development in the last two genera, and despite their certain relations with the restricted *Lithospermeae*, they have been forced into the *Echieae*. Zygomorphy is sporadic in the *Boraginoideae*, and there seems no good reason why its several occurrences in the *Lithospermeae* should characterize a special tribe when the corolla-irregularities of *Lycopsis* in the *Anchuseae*, and *Caccinia* in the *Cynoglosseae* go unrecognized. As the vegetative and fruiting structures of the *Lithospermeae* and the *Echieae* are quite similar, it seems best, especially since zygomorphy in the *Echieae* is probably polyphyletic, to combine the two tribes as is done in this paper. With the disappearance of the *Echieae* the four remaining tribes of the subfamily, like the subfamilies themselves, are all definable without reference to corolla-structures and entirely upon the characters of the pistil, particularly the attachment of the nutlets, the shape of the gynobase, and the number and relations of the stigmas. The endemic American genera referable to the *Lithospermeae* are *Macromeria*, *Lasiarrhenum*, *Onosmodium*, *Antiphytum*, *Moritzia*, and *Thaumatocaryon*. Concerning the correct tribal position of the last three genera there is still some doubt.

Key to Genera of Lithospermeae.

Stamens deeply sagittate, auricles frequently tailed; corolla somewhat cylindrical or globose with very short broad lobes.
Nutlets confluent to form two 2-celled nutlets; leaves amplexicaul; plant glabrate, green ..... 1. *Cerinthe.*
Nutlets all distinct and single-celled; leaves narrowed to their attachment, never amplexicaul; plant conspicuously pubescent, more or less canescent.
Corolla more or less cylindrical, not inflated towards the base; filaments slender ..... 2. *Onosma.*
Corolla somewhat globose, with 5 saccate inflations near base; filaments broadened and thickened above attachment ..... 3. *Maharanga.*
Stamens not conspicuously sagittate; corolla only exceptionally cylindrical, lobes well developed.
Anthers apically with a subulate prolongation, this connivent about the style.
Filaments dorsally inflated ..... 4. *Cystostemon.*
Filaments not at all inflated ..... 5. *Vaupelia.*
Anthers obtuse or merely mucronate at apex.
Corolla regular or practically so.
Nutlets strongly bent below the middle, arching over the somewhat convex gynobase, usually somewhat stipitate due to a constriction just above the basal areola ..... 6. *Alkanna.*

Nutlets straight or practically so, substipitate only in *Sericostoma*.
Throat of corolla appendaged or obviously pubescent or both.
Stamens attached at unequal heights in the pubescent corolla-tube.....7. *Aipyanthus*.
Stamens attached at equal heights.
Throat of corolla conspicuously villous and more or less closed by the pubescence.....8. *Sericostoma*.
Throat of corolla not notably villous and not obscured by the pubescence.
Nutlets cornute-acuminate; foliage ample, herbaceous; corolla conspicuously pubescent in the tube, faucal appendages or downy areas not developed.....9. *Ancistrocarya*.
Nutlets rounded or obtusely conical at apex; leaves narrow, firm; corolla with faucal protuberances or pubescent or with glandular areas.....10. *Lithospermum*.
Throat of corolla glabrous or glabrate; corolla appendaged or pubescent inside only at very base if at all.
Style and stamens protruded at least past corolla-sinuses and usually much beyond.....11. *Moltkia*.
Style and stamens not reaching corolla-sinuses.
Corolla longitudinally plicate within below, about half length of very elongate linear calyx-lobes; biennial.....12. *Macrotomia*.
Corolla not plicate, always exceeding calyx; annual or perennial.....13. *Arnebia*.
Corolla manifestly irregular.
Corolla transversely plicate in throat; anthers somewhat sagittate; filaments equal and borne at equal heights in corolla.....14. *Zwackhia*.
Corolla not plicate in throat; anthers oblong or ovate; filaments commonly unequal and borne at unequal heights in the corolla.
Style and stamens short, included, not evident.....15. *Echiochilon*.
Style and filaments usually long, evident, protruded from the corolla or nearly so.
Nutlets smoothish and rounded, very large; rank herbs with fruiting calyx 2–3 cm. long.....16. *Megacaryon*.
Nutlets tuberculate and somewhat angulate; herbs or shrubs with fruiting calyx 13 mm. long or less..17. *Echium*.

1. **Cerinthe** [Tourn.] L. Sp. Pl. 136 (1753); Gen. Pl. 66 (1754).

A very natural genus of 4 or 5 species, occurring in the Mediterranean Region and in Central Europe. The 2-celled nutlets characteristic of this genus are evidently the result of the confluence of 2 distinct nutlets, since in some species the line of fusion and the distinct apices of the conjoined nutlets are readily discernible. Although recently treated by me, Contr. Gray Herb. n. s. lxx. 5 (1924), as of the *Eritrichieae*, the genus is indubitably an immediate relative of *Onosma* and hence belongs to the *Lithospermeae*.

2. **Onosma** L. Sp. Pl. ed. 2, 196 (1762); Gen. Pl. ed. 6, 76 (1764).

Colsmannia Lehm. Mag. Ges. Naturf. Berlin viii. 92, t. 4 (1818); Asperif. ii. 356 (1818). *Podonosma* Boiss. Diag. ser. 1, xi. 113 (1849); Fl. Orient. iv. 178 (1875).—A large natural genus of the Mediterranean Region and western Asia. *Onosma syriacum* agrees with the other species of the genus in its flowers and habit, but differs in having incurved nutlets that are apparently joined laterally to a pyramidal gynobase. The genus *Podonosma* was erected for this species. It may be worthy of recognition.

3. **Maharanga** A. DC. Prodr. x. 71 (1846).

A genus closely related to *Onosma*, but readily separated by its saccate corolla. It occurs in Nepal and Sikkim and contains 2 closely related species, *M. Emondi* (Wall.) A. DC. and *M. Wallichianum* A. DC.

4. **Cystostemon** Balf. f. Proc. Royal Soc. Edinb. xii. 82 (1883); Trans. Royal Soc. Edinb. xxxi. 186, t. 56 (1888).

A remarkable genus containing one species, *C. socotranus* Balf. f., a very distinct endemic of Socotra.

5. **Vaupelia** Brand in Fedde, Repert. xiii. 82 (1914).

A genus of 7 species, ranging from southwest Africa to Arabia. The members of the genus have a remarkable habital similarity to *Trichodesmia*, and most of its species have been transferred from that genus. As pointed out by Brand, however, its relations are clearly with *Cystostemon*, from which it differs only in the form of the filament.

6. **Alkanna** Tausch, Flora vii. 234 (1824).

Baphorhiza Link, Handb. i. 578 (1829). *Campylocaryum* DC. in Meisner, Gen. i. 280; ii. 189 (1840). *Camptocarpus* C. Koch, Linnaea xvii. 304 (1843).—About 25 species in the Mediterranean Region and western Asia. Although commonly referred to the *Anchuseae* the species of this genus have nutlets lacking a broadly rimmed areola and plug-shaped strophiola, and have a habit somewhat different from the other members of that tribe. It seems best referred to the *Lithospermeae*, since, as shown by the direction of the funicle and the bent seed, the nutlets are in fact basally attached. Although attached by the morphological base, the sharp bend at the middle of the nutlet gives an impression of a lateral attachment. The areola,

which is substipitate and slightly oblique, is attached to a convex gynobase.

7. **Aipyanthus** Stev. Bull. Soc. Nat. Moscou xxiv. pt. 1, 599 (1851).

A single species, *A. echioides* (L.) Stev., growing at high altitudes in western Asia. Commonly referred to *Macrotomia*, but differing in having the corolla-tube pubescent within, and in having the stamens placed at unequal heights on the corolla. It differs also in habit.

8. **Sericostoma** Stocks in Wight, Icones iv. pt. 2, 14, t. 1377 (1850).

Species above 5, all of restricted range, and occurring in western India, Persia, Arabia, and Somaliland, usually at no great distance from the ocean. *Sericostoma pauciflorum* Stocks, *S. strigosa* Defl., and *S. verrucosum* Beck have nutlets with a suprabasal substipitate attachment. I have seen no fruit of *S. Kotschyi* (Boiss.) Benth. or *S. albidum* Franch. The genus departs from the *Lithospermeae* in its nutlets and pyramidal gynobase, but its corolla, style, habit, and range emphasize its relations in that tribe.

9. **Ancistrocarya** Maxim. Bull. Acad. St. Petersb. xvii. 443 (1872).

With a single species, *A. japonica* Maxim., from Japan. Evidently related to *Lithospermum*, but differing in its broad veined foliage, acuminate nutlets, and densely pubescent corolla-tube.

10. **Lithospermum** [Tourn.] L. Sp. Pl. 132 (1753); Gen. Pl. 64 (1754).

Buglossoides Moench, Meth. 418 (1794). *Aegonychon* S. F. Gray, Nat. Arrang. Brit. Pl. ii. 354 (1821). *Rhytispermum* Link, Handb. i. 579 (1829). *Margarospermum* Reichb. in Spach, Hist. Nat. Veg. Phaner. ix. 31 (1840); Decne. in Jacquemont, Voy. Ind., Bot. 122 (1844).—A polymorphous genus of 50 to 60 species, about 10 in South Africa and about the same number in Eurasia, the remainder in America. The American species find their nearest relations in South Africa, and in Japan and adjacent Asia. The shrubby Mediterranean species, usually referred to *Lithospermum*, appear to be generically distinct, and seem best placed in the *Anchuseae*.

11. **Moltkia** Lehm. Neu. Schrift. Naturf. Ges. Halle iii. pt. 2, 3 (1817).

A genus of 8 species, 6 in the Balkans and Near East, one in the Himalayas, and one widely distributed in the deserts of northern Africa and southwestern Asia. The genus is taken here as defined by Wettstein, Oesterr, Bot. Zeitschr. lxvii. 367 (1918). The plant current as *Lithospermum callosum* fits best into *Moltkia*, but in habit and slightly irregular corollas it is aberrant. The lobes of the corolla of *M. callosa* (Vahl) Wetts. are a trifle irregular and two of the lower stamens are usually shorter than the others. It seems best to leave the plant in *Moltkia*, however, since its distinctive characters are not positive.

12. **Macrotomia** DC. in Meisner, Gen. i. 281; ii. 190 (1840).

Leptanthe Klotzsch, Bot. Ergenb. Reise Prinz Waldemar 95, t. 63 (1862).—Containing a single species, *M. Benthami* (Wall.) DC., which occurs in the western Himalayas. From *Arnebia*, its closest relative, *Macrotomia* differs in its characteristic biennial habit, in its short corollas much exceeded by the calyx-lobes, and in the longitudinal plication that marks the lower side of the corolla-tube. As *Macrotomia* has been usually defined it is patently unnatural, since the three species referred to it represented as many genera, and in other than tribal characters agree only in a rank habit of growth. *Macrotomia echioides* is here referred to *Aipyanthus*, and *M. cephalotes* is transferred to *Arnebia*.

13. **Arnebia** Forsk. Fl. Aegypt. 62 (1775).

Dioclea Spreng. Syst. i. 502 and 556 (1825). *Strobila* Don, Gen. Syst. iv. 327 (1837). *Meneghinia* Endl. Gen. 648 (1838). *Stenosolenium* Turcz. Bull. Soc. Nat. Moscou xiii, pt. 2, 253 (1840). *Munbya* Boiss. Diag. ser. 1, xi. 114 (1849). *Toxostigma* A. Rich. Ten. Fl. Abyss. ii. 86, t. 77 (1851).—A large polymorphous genus centering in western Asia. It is well characterized by its herbaceous habit, included stamens and style, and corolla with glabrous tube and unappendaged throat. There seems no good reason why the plants passing as *Macrotomia cephalotes* (DC.) Boiss. and *M. euchroma* (Royle) Hook. f. & Thoms. should not be referred to *Arnebia*. Both differ in habit and floral characters from *Macrotomia Hookeri*, the type of its genus, and both lack structural characters by which they can be distinguished from *Arnebia*. The former was originally described as *Arnebia cephalotes* by De Candolle, and is notable only

because of its coarse habit and large flowers. It seems merely a glorified member of its genus. There is even less reason for excluding *M. euchroma* from *Arnebia*, since it differs from the members of that genus only in its coarser habit of growth. Its relations seem so obvious that the following combination appears entirely justified.

Arnebia euchroma (Royle), comb. nov. *Lithospermum euchromon* Royle acc. Benth. in Royle, Illust. i. 305 (1839); DC. Prodr. x. 82 (1846). *Macrotomia euchroma* Hook. f. & Thom. acc. Clarke, Hook. Fl. Brit. India iv. 177 (1883); Paulsen, Bot. Tidssk. xxvii. 216 (1906). For further synonymy see Lipsky, Act. Hort. Petrop. xxvi. 505 (1910).

14. **Zwackhia** Sendtn. in Reichb. Icon. Fl. Germ. xviii. 65, t. 115 (1858).

Halacsya Dörfler, Allgem. Bot. Zeitschr. 1903, pg. 46 (1903).—A single species, *Z. Sendtneri* (Boiss.) Maly., in Jugo-Slavia. Although with an irregular corolla the relations of the plant seem to be with *Lithospermum* or *Moltkia*, cf. Wettstein, Oesterr. Bot. Zeitschr. lxvii. 365 (1918), rather than with *Echium*, the genus with which it has been usually associated.

15. **Echiochilon** Desf. Fl. Atlant. i. 166, t. 47 (1800).

Chilochium Raf. Ann. Gen. Soc. Phys. viii. 269 (1821). *Exioxylon* Raf. Fl. Tellur. iv. 85 (1838). *Leurocline* S. Moore, Jour. Bot. xxxix. 257, t. 424, fig. 1, (1901).—Six species in Africa and southwestern Asia. There seems to be no valid reason for recognizing *Leurocline*. All the species referred to *Leurocline* and to *Echiochilon* have a similar rather odd, bilabiate corolla, and short included stamens that are borne at unequal heights in the hairy throat of the corolla. The bracteate inflorescence and irregular calyx is common to all, in addition to a common general aspect. The range of the enlarged *Echiochilon* is thoroughly natural. The difference in nutlet-attachment that is supposed to distinguish the two genera does not seem to be borne out in fact. *Leurocline* is said to be distinguished from its relative by having its nutlets "fixed by a flat base to a flat (not conical) gynobase." However, in the type species of *Leurocline*, *L. lithospermoides* Moore, the nutlets are not so affixed, but are clearly attached suprabasally to a subulate gynobase. In *Echiochilon fruticosum*, the type species of its genus, the nutlet has a straight and angled inner edge, is strongly constricted dorsally at the base, and bears its very small areola on the slightly oblique tip of the neck-like

basal portion. The areola of *E. fruticosum*, which is more nearly basal than in any species of *Leurocline*, is attached to a subulate gynobase quite like that in *Leurocline*, but much nearer the base than in any species of that genus. When all the species of these two genera are considered and the various nutlet-attachments studied, the hopes of finding generic characters in the form of nutlets or in their attachments are completely blasted. Past writers have relied upon the irregular calyx of *Echiochilon* to distinguish it from *Echium*. This is not only unnecessary, but is impossible, for the calyces of such Echiums as *E. piniana* Webb & Berth. and *E. Decaesnei* Webb are even more irregular than are those of *Echiochilon*. The bibliography of the species referable to *Echiochilon* is as follows:—

ECHIOCHILON FRUTICOSUM Desf. Fl. Atlant. i. 167, t. 47 (1800); Blatter, Record Bot. Surv. Ind. viii. 316 (1921). *Lithospermum divaricatum* Sieb. in Spreng. Syst. i. 543 (1825–28).—Northern Africa and southwestern Asia.

E. LONGIFLORUM Benth. in Hook. Icon. xiii. 60, t. 1277 (1878).—Aden.

E. somalense (Franchet), comb. nov. *Lobostemon somalensis* Franchet, Sert. Somal. 44 (1882). *Leurocline somalensis* S. Moore, Jour. Bot. xxxix. 258 (1901).—Somaliland.

E. cryptocephalum (Baker), comb. nov. *Lobostemon cryptocephalum* Baker, Kew Bull. 1894, pg. 30 (1894).—British Central Africa. Perhaps not of this genus.

E. lithospermoides (S. Moore), comb. nov. *Leurocline lithospermoides* S. Moore, Jour. Bot. xxxix. 257, t. 424, fig. 1 (1901). *Lobostemon lithospermoides* Baker, Fl. Trop. Africa iv. pt. 2, 60 (1905).—British East Africa.

E. Chazaliei (Boissieu), comb. nov. *Lithospermum Chazaliei* Boissieu, Jour. de Bot. x. 220 (1896). *Leurocline Chazaliei* Bonnet, Bull. Soc. Bot. France lviii. 38 (1911); Chevalier, Expl. Bot. Afri. Occ. Franç. i. 452 (1920). *Leurocline mauritanica* Bonnet, Bull. Mus. Hist. Nat. Paris xiv. 403 (1908); Fedde, Repert. ix. 496 (1911).—Mauritania.

16. **Megacaryon** Boiss. Pl. Orient. Nov. i. 7 (1875).

A genus of the Levant which is doubtfully distinct from *Echium*, from which it is weakly separated by its smoothish nutlets and greatly accrescent calyx. A discussion of this monotype is given by Lacaita, Jour. Linn. Soc. xliv. 393 (1919).

17. **Echium** [Tourn.] L. Sp. Pl. 139 (1753); Gen. Pl. 68 (1754).

Lobostemon Lehm. Linnaea v. 378, t. 5 (1830); Buek, Linnaea xi. 129 (1837). *Isorium* Raf. Fl. Tellur. ii. 61 (1836). *Traxara* Raf. Fl. Tellur. iv. 85 (1838). *Isoplesion* Raf. l. c. 86. *Oplexion* Raf. l. c. 86. *Larephes* Raf. l. c. 86. *Argyrexias* Raf. l. c. 86. *Penthysa* Raf. l. c. 86.—The largest and most difficult genus of its tribe. Native in the Mediterranean Region, on the Atlantic Islands, and in South Africa. I have searched in vain for characters which would distinguish generically the South African species from those north of the equator. Most of the South African species have stamens with a tuft of hair at the base of the filament. It was with this character that *Lobostemon* was originally distinguished from the more northern *Echiums*, and upon which it has been chiefly maintained subsequently. It is strange, therefore, to find that a goodly number of species of *Lobostemon*, such as *L. alopecuroideus*, *L. eriostachyus*, *L. latifolius*, *L. sanguineus*, *L. splendens*, etc., have stamens which not only in pubescence and attachment, but in size and appearance are quite indistinguishable from those of indubitable Echiums. These species, in fact, were at one time referred to *Echium* by De Candolle, Prodr. x. 13 (1846). Some authors, realizing the utter failure of staminal structures as generically diagnostic characters, have sought to maintain *Lobostemon* by finding diagnostic characters in the shape of the stigma. The stigma in the South African species, though usually given as entire or subcapitate, in fact varies from entire and solitary to divided with the stigmas geminate. *Echium* usually has lobed styles, but *E. rubrum*, as pointed out by Lacaita, Jour. Linn. Soc. xliv. 365 (1919), has the stigma merely emarginate or divided in a manner quite indistinguishable from that of *Lobostemon*. *Echium* and *Lobostemon* are not to be distinguished habitally, and if such authors as Wright, Fl. Cap. iv. pt. 2, 44 (1904), are followed in the generic disposition of *Echium formosum*, then there is no distributional difference between the two genera. Since its claims to generic rank are no more strong than are those of the giant Echiums of the Atlantic Islands, I see no reasons why *Lobostemon* should not be merged with *Echium*. The following new combinations are required:—

Echium acutissimum (Buek), comb. nov. *Lobostemon acutissimus* Buek, Linnaea xi. 139 (1837).

E. Buekii, nom. nov. *L. elongatus* Buek, l. c. 140. Not *Echium elongatum* Lam. (1791).

E. capitiforme (DC.), comb. nov. *L. capitiformis* DC., Prodr. x. 12 (1846).

E. cephaloideum (DC.), comb. nov. *L. cephaloideus* DC., l. c. 12.
E. cinereum (DC.), comb. nov. *L. cinereus* DC., l. c. 10.
E. curvifolium (Buek), comb. nov. *L. curvifolius* Buek, l. c. 137.
E. diversifolium (Buek), comb. nov. *L. diversifolius* Buek, l. c. 140.
E. echioides (Lehm.), comb. nov. *L. echioides* Lehm., Linnaea v. 378, t. 5 (1830).
E. fastigiatum (Buek), comb. nov. *L. fastigiatus* Buek, l. c. 141.
E. Galpinii (Wright), comb. nov. *L. Galpinii* Wright, Fl. Cap. iv. pt. 2, 41 (1904).
E. microphyllum (Buek), comb. nov. *L. microphyllus* Buek, l. c. 142.
E. nitidum (Bolus), comb. nov. *L. nitidus* Bolus in Wright, l. c. 38.
E. obovatum (DC.), comb. nov. *L. obovatus* DC., l. c. 10.
E. obtusifolium (DC.), comb. nov. *L. obtusifolius* DC., l. c. 7.
E. oederiaefolium (DC.), comb. nov. *L. oederiaefolius* DC., l. c. 7.
E. paniculaeforme (DC.), comb. nov. *L. paniculaeformis* DC., l. c. 8.
E. pilicaule (Wright), comb. nov. *L. pilicaulis* Wright, l. c. 30.
E. pubiflorum (Wright), comb. nov. *L. pubiflorus* Wright, l. c. 39.
E. sanguineum (Schlechter), comb. nov. *L. sanguineus* Schlechter, Engler's Bot. Jahrb. xxiv. 450 (1897).
E. Schlechteri, nom. nov. *L. collinus* Schlechter in Wright, l. c. 28. Not *E. collinum* Salisb. (1796).
E. stachydeum (DC.), comb. nov. *L. stachydeus* DC., l. c. 7.
E. virgatum (Buek), comb. nov. *L. virgatus* Buek, l. c. 142.
E. Wurmbii (DC.), comb. nov. *L. Wurmbii* DC., l. c., 11.

Anchuseae.

Nutlets erect or oblique or horizontal, straight or curved, smooth or rugose, unmargined; areola basal or lateral, along side or near tip of cotyledons, surrounded by a tumid annular rim, more or less plug-like or rarely merely high-convex, strophiolate; gynobase usually convex, commonly with broad cavities left by the strophiolate plugs; style lobed or entire; stigmas 1 or 2, distinct or completely fused, capitate; corolla blue or rarely white or yellow.—The tribe is confined to the Old World.

Key to Genera of Anchuseae.

Throat of corolla bearing well developed appendages formed by the intrusion of tissue.
  Filaments with a broad dorsal appendage.....18. *Borago.*
  Filaments unappendaged dorsally.
    Stamens conspicuously exserted from the corolla; corolla-lobes linear, revolute.....19. *Trachystemon.*

Stamens included or barely exserted; corolla-lobes broad, never revolute.
Corolla broadly tubular; throat conspicuously developed, campanulate or weakly dilated; lobes short, erect or apically recurved; faucal appendages linear or lanceolate, acute, margin dentate.....20. *Symphytum.*
Corolla funnel-form or more or less long-salverform; throat undeveloped or ill-defined or abruptly expanded; lobes usually elongate, spreading or divergent; faucal appendages deltoid or oblong, obtusish, usually hairy.
Corolla-lobes convolute in the bud.....21. *Trigonocaryum.*
Corolla-lobes imbricate in the bud.
Corolla evidently irregular, limb oblique, tube usually bent.....22. *Lycopsis.*
Corolla regular, limb not oblique, tube straight.
Nutlet-attachment small, borne on a bent supra-basal stipitate prolongation of the nutlet; flowers in long-peduncled leaf-subtended glomerules; leaves broad, netted-veined...23. *Caryolopha.*
Nutlets with a broad sessile basal or lateral attachment; flowers racemose or in axillary glomerules.
Inflorescence naked; leaves herbaceous, broad, obviously netted-veined.....24. *Brunnera.*
Inflorescence bracteate throughout; leaves firm, elongate, vernation absent or obscure.....25. *Anchusa.*
Throat of corolla unappendaged or practically so, commonly glabrous or villous in spots.
Corolla glabrous within; calyx-tube indurated and thickened in fruit; plant fruticose.....26. *Lithodora.*
Corolla more or less pubescent within; calyx herbaceous; herbs.
Stamens borne at summit of corolla-throat and evidently protruded from it.....27. *Elizaldia.*
Stamens borne on corolla-tube, not at all protruded.
Plants mainly annual; nutlets usually rugose.....28. *Nonea.*
Plants perennial; nutlets smooth.....29. *Pulmonaria.*

18. **Borago** [Tourn.] L. Sp. Pl. 137 (1753); Gen. Pl. 67 (1754).

Buglossites Moris, Enum. Sem. Hort. Taur. (1845); Ann. Nat. Sci. ser. 3, v. 365 (1846).—A natural genus with 3 very distinct species, all in the Mediterranean Region. Hance, Jour. Bot. xvii. 301 (1879), has an interesting discussion of the etymology of the word, "borage."

19. **Trachystemon** Don, Edinb. New Philos. Jour. xiii. 239 (1832).

Nordmannia Ledeb. in Nordmann, Bull. Acad. St. Petersb. ii. 312 (1837). *Psilostemon* DC. Prodr. x. 35 (1846).—A natural genus with 2 well marked species in the Mediterranean Region.

20. **Symphytum** [Tourn.] L. Sp. Pl. 136 (1753); Gen. Pl. 66 (1754).

Twenty-five species in Europe and adjacent Asia. The genus was recently monographed by Bucknell, Jour. Linn. Soc. xli. 493 (1913).

21. **Trigonocaryum** Trautv. Act. Hort. Petrop. iii. pt. 2, 278 (1875).

With a single Caucasian species. I know the plant only from descriptions.

Trigonocaryum involucratum (Stev.), comb. nov. *Myosotis involucrata* Stev. Mém. Soc. Nat. Moscou iii. 253 (1812); Bull. Soc. Nat. Moscou xxiv. pt. 1, 602 (1851); Boiss. Fl. Orient. iv. 242 (1875). *T. prostratum* Trautv. Act. Hort. Petrop. iii. pt. 2, 278 (1875); l. c. iv. pt. 2, 395 (1876).

22. **Lycopsis** L. Sp. Pl. 138 (1753); Gen. Pl. 68 (1754).

Buglossa S. F. Gray, Nat. Arrang. Brit. Pl. ii. 351 (1821).—Three species in the Mediterranean Region and Near East. A very close relative of *Anchusa*, from which it differs only in its more or less irregular corollas. Some of the undoubted Anchusas show a slight tendency towards zygomorphy, though never in such an extreme manner as characteristic of *Lycopsis*. Many authors have treated *Lycopsis* merely as a section of *Anchusa*, a treatment with which I am not unsympathetic.

23. **Caryolopha** Fisch. & Trautv. Ind. Sem. Hort. Petrop. iii. 31 (1837).

With a single species, *C. sempervirens* (L.) Fisch. & Trautv., in the northwestern Mediterranean Basin. In recent works usually referred to the closely related genus *Anchusa*. *Caryolopha*, however, appears to merit recognition because of its peculiar nutlets, leafy and ranker habit, and different inflorescence.

24. **Brunnera** Stev. Bull. Soc. Nat. Moscou xxiv. pt. 1, 582 (1851).

A neglected genus, with 3 species in western Siberia and the eastern Mediterranean Region. The species have been usually referred to *Anchusa*, but their quite different habit and naked racemes seem to justify their recognition as generically distinct.

Brunnera macrophylla (Marschall), comb. nov. *Myosotis macrophylla* Marschall, Fl. Taur.-Cauc. i. 119 (1808); Ledeb. Fl. Ross. iii.

121 (1847–49). *Anchusa myosotidiflora* Lehm. Asperif. i. 234 (1818); Boiss. Fl. Orient. iv. 157 (1875). *B. myosotidiflora* Stev. Bull. Soc. Nat. Moscou xxiv. pt. 1, 582 (1851).

B. SIBIRICA Stev. Bull. Soc. Nat. Moscou. xxiv. pt. 1, 582 (1851). *Anchusa myosotidiflora*, var. *grandiflora* DC. Prodr. x. 50 (1846).

B. orientalis (Schenk), comb. nov. *Myosotis orientalis* Schenk, Pl. Sp. Itin. Aegypt. 26 (1840). *Anchusa neglecta* A. DC. Prodr. x. 49 (1846).

25. **Anchusa** L. Sp. Pl. 133 (1753); Gen. Pl. 64 (1754).

Buglossum Gaertn. Fruct. i. 322 (1788). (?) *Stomotechium* Lehm. Asperif. ii. 395 (1818). *Pentaglottis* Tausch, Flora xii. 643 (1829). *Gastrocotyle* Bunge, Mem. Acad. Sav. Etr. St. Petersb. vii. 405 (1847). —A variable genus of 30–40 species centering in the Mediterranean Region, but extending through Europe and western Asia, and occurring also in South Africa. Why authors have deemed it advisable to segregate *A. hispida* Forsk. as forming the monotypic genus *Gastrocotyle* is very puzzling, but their reasons for removing it from the *Anchuseae* and placing it in the *Eritrichieae* are utterly incomprehensible. As indicated by Boissier, Fl. Orient. iv. 151 (1875), *A. hispida* is an obvious relative of the annuals, *A. aggregata* Lehm., and *A. Aucheri* A. DC., and is clearly congeneric with these two species, the generic determination of which has never been questioned.

The following species seems to have never been properly named:—

Anchusa humilis (Desf.), comb. nov. *Echium humile* Desf. Fl. Atlant. i. 165 (1800). *A. aggregata* Lehm. Asperif. i. 219 (1818); Icon. 27, t. 47 (1821); Boiss. Fl. Orient. iv. 157 (1875).

26. **Lithodora** Griseb. Spicil. Fl. Rumel. ii. 85 (1844).

Gymnoleima Decne. in Jacquemont, Voy. Ind., Bot. 122 (1844).—A genus of 7 local species, centering in the western Mediterranean Basin. These plants have been commonly referred to *Lithospermum*, but they differ from that genus in their shrubby habit, indurated fruiting calyx-tube, corollas which inside are destitute of either appendages or pubescence, cf. Spengler, Oesterr. Bot. Zeitschr. lxviii. 115, t. 1, fig. 17–22 (1919), and plug-shaped somewhat margined attachment of the nutlets. The group is certainly not referable to *Lithospermum* if the current standard of generic characters is maintained. *Lithodora* has many characters in common with *Moltkia*, and perhaps it should be associated with that genus in the *Lithospermeae*, rather than classed under the *Anchuseae*. The shape and

attachment of the nutlets, as well as its unappendaged corollas, are similar to those found in *Pulmonaria* and *Nonea*, particularly in the former genus. In the attachment of its nutlets *Lithodora* is clearly characteristic of the *Anchuseae*. Besides *Lithodora fruticosa* (L.) Griseb., *L. hispidula* (Sibth. & Sm.) Griseb , and *L. olcifolia* (Lapeyr.) Griseb. there are the following species which have not been properly named.

Lithodora consobrina (Pomel), comb. nov. *Lithospermum consobrinum* Pomel, Nouv. Mat. Fl. Atl. 296 (1874) .

L. diffusa (Lag.), comb. nov. *Lithospermum diffusum* Lag. Varied. Cienc. iv. pt. 4, 39 (1805); Gen. Sp. Pl. 10 (1815); Rouy & Fouc. Fl. Fr. x. 314 (1908). *Lithospermum prostratum* Lois. Fl. Gall. ed. 1, 105 (1806). *Lithodora prostrata* Griseb. Spicil. Fl. Rumel. ii. 531 (1844).

L. rosmarinifolia (Ten.), comb. nov. *Lithospermum rosmarinifolium* Ten. Prodr., Suppl. ii. 66 (1811 -13); Fl. Nap. i. t. 114 (1811–15).

L. Zahnii (Heldr.), comb. nov. *Lithospermum Zahnii* Heldr. in Halacsy, Verh. Zool.-Bot. Ges. Wien xlix. 190 (1899); Consp. Fl. Graecae. ii. 347 (1902). *Lithospermum fruticosum* of Sibth. & Sm. Fl. Graeca ii. 52, t. 161 (1813).

27. **Elizaldia** Willk. Strand- u. Steppengeb. Iber. Halbins. 128 (1852).

The 3 species of this western Mediterranean genus have been usually referred to *Nonea*, but in having a slightly different habit, and stamens placed high in the corolla-throat and exserted, they seem generically distinct. The generic name, *Phaneranthera*, is a synonym of *Elizaldia*, but appears to have never been legitimately established. The founding of the genus is usually attributed to Meisner, Gen. ii. 189 (1840), but he does not even mention the name. The following combinations are necessary.

Elizaldia violacea (Desf.), comb. nov. *Echioides violacea* Desf. Fl. Atlant. i. 164 (1800). *Nonnea violacea* DC. Fl. Fr. iii. 626 (1805). *N. multicolor* G. Kunze, Flora xxix. 691 (1846). *E. nonneoides* Willk. Strand- u. Steppengeb. Iber. Halbins. 129, cum tab. (1852).

E. phaneranthera (Viv.), comb. nov. *Nonnea phaneranthera* Viv. Fl. Lib. Specim. 9, t. 1, fig. 3 (1824); Murb. Lunds Univ. Årsskr. xxxiv. Afd. 2, no. 7, 10, t. 7, fig. 10–12 (1898).

E. heterostemon (Murb.), comb. nov. *Nonnea heterostemon* Murb. Lunds Univ. Årsskr. xxxiv. Afd. 2, no. 7, 7, t. 7, fig. 13–15 (1898).

28. **Nonea** Medik. Phil. Bot. i. 31 (1789).

Oskampia Moench, Meth. 420 (1794). *Echioides* Desf. Fl. Atlant. i. 163 (1800). *Onochilis* Mart. Denkschr. Acad. Muenchen v. 177 (1817). *Nephrocarya* Candargy, Bull. Soc. Bot. France xliv. 150 (1897).—About 25 species, these chiefly in the Mediterranean Region. Although maintained here, I am of the opinion that *Nonea* should be treated as a section of *Pulmonaria*, for there is no character by which it can be decisively separated from that genus. *Nonea* and *Pulmonaria* have the same corolla and calyx. Though the nutlets of *Nonea* are usually rugose, smooth and shiny ones, similar to those in *Pulmonaria*, occur in *N. obtusifolia* (Willd.) DC. *Nonea* usually has a loosely racemose inflorescence, whereas *Pulmonaria* commonly has a loosely glomerate one, but when the inflorescence of the latter occasionally loosens it reveals an arrangement of flowers quite like that in *Nonea*. The most striking difference between the two genera seems to reside in the root. *Pulmonaria* is always perennial, the stems, in scaly-based tufts, terminating rather fleshy shallow rhizomes. *Nonea* is mostly annual, but in such species as *N. pulla* and *N. alpestris* the subterranean development is apparently a long deep perennial tap-root. It seems probable that *Nonea* and *Pulmonaria* have common immediate ancestors, and that the former is a xerophytic adaptation to rather arid open situations, whereas the latter is a mesophytic adaptation to scopuline and sylvestrine habitats.

29. **Pulmonaria** [Tourn.] L. Sp. Pl. 135 (1753); Gen. Pl. 65 (1754).

Bessera Schult. Observ. Bot. 27 (1809).—A genus with about 12 ill-defined Eurasian species. It centers in southern Europe.

Eritrichieae.

Nutlets erect or suberect (or rarely horizontal), straight or slightly bent, smooth or verrucose or appendaged, margined or marginless; areola lateral or basal, at side of cotyledons or near their tip; gynobase pyramidal or columnar or rarely even flat; style entire; stigma 1, entire or very rarely somewhat emarginate, capitate or disciform; corolla blue or white or less commonly yellow or orange.—As a group the *Eritrichieae* are intermediate in degree of development between the *Lithospermeae* and the *Cynoglosseae*. Such genera as *Megastoma*, *Oreocarya*, and *Mertensia* are among the most primitive members of the tribe, whereas such genera as *Eritrichium*, *Lappula* and *Trigonotis* are the most specialized, coming nearest the *Cynoglosseae*. The

tribe reaches its great development in Asia and in western America. The endemic American genera properly referable to this tribe are *Amsinckia, Cryptantha, Oreocarya,* and *Selkirkia.*

Key to Genera of Eritrichieae.

Nutlets circumdorsally winged, or with a definite upturned usually toothed or lacerate rim or flange, or some or all with an epidorsal annulate or cupulate crest, or pronouncedly angular and evidently tetrahedral.
Gynobase flat; nutlets regularly tetrahedral, attached at one corner.
Style conspicuously long-exserted; anthers fully exposed; leaves crowded above, subverticillate.....30. *Brachybothrys.*
Style and anthers included; leaves scattered, alternate....31. *Trigonotis.*
Gynobase pyramidal or columnar; nutlets not obviously and regularly tetrahedral.
Nutlets about equalling the elongate gynobase, attached for nearly their whole length, (with rare exceptions) exceeded by style.
Bracteate weedy annuals with narrow strigose canescent firm unnerved leaves; nutlet-margin toothed or lacerate, frequently glochidiate.....32. *Lappula.*
Ebracteate rank decorative perennial with broad glabrous herbaceous veiny leaves; nutlets with a broad merely undulate wing.....33. *Myosotidium.*
Nutlets much surpassing the stout pyramidal gynobase, attached obliquely supramedially by a deltoid or ovate areola, surpassing the style.
Nutlets with a circumdorsal, commonly lacerate or dentate margin.
Fruiting calyx reflexed; rank tufted plants with broad herbaceous leaves.....34. *Hackelia.*
Fruiting calyx erect or ascending; low densely caespitose plants with small firm leaves.....35. *Eritrichium.*
Nutlets (some or all of each fruit) with an epidorsal cupulate or annulate crest.
Stamens conspicuously exserted from the unappendaged corolla; nutlets with a subapical cupulate crest.
36. *Craniospermum.*
Stamens included within the appendaged corolla; some of nutlets with a thick medial dorsal annulate crest.....37. *Microula.*
Nutlets not encircled by a wing, rim, or flange, never bearing epidorsal annulate or cupulate crests, somewhat lanceolate or lenticular and never conspicuously angular or polyhedral.
Corolla-lobes convolute in bud; style disciform, mucronate...38. *Myosotis.*
Corolla-lobes imbricate in bud; style usually capitate.
Pericarp not fused along medial ventral line, nutlets hence more or less broadly grooved anteriorly.
Flowers fasciculate, falsely umbellate; diminutive Himalayan annuals.....39. *Microcaryum.*
Flowers loosely racemose; plants not diminutive.
Corolla appendaged, blue; nutlets several times as long as gynobase, attached suprabasally by a small areola; perennial; central Asia.....40. *Amblynotus.*

Corolla unappendaged, yellowish; nutlets broadly and laterally affixed to gynobase, exceeding it in length; annual; northern Africa.....41. *Megastoma.*
Pericarpial walls fused along medial ventral line, forming a medial ventral keel extending from areola to apex of nutlet.
Nutlets attached firmly to gynobase for nearly whole length.
Ovules 2; nutlets contorted.....42. *Rochelia.*
Ovules 4; nutlets not contorted.....43. *Oreogenia.*
Nutlets attached to gynobase through a definite areola.
Flowers solitary, terminal; nutlets densely pubescent; pulvinate Himalayan perennials.....44. *Chionocharis.*
Flowers several to many, inflorescence various; nutlets glabrous.
Fruiting calyx strongly accrescent, plicate, veiny, irregularly toothed and lobed; nutlets obliquely attached to an elongate strongly compressed gynobase.....45. *Asperugo.*
Fruiting calyx moderately if at all accrescent, not plicate, nor conspicuously veiny, nor irregularly toothed and lobed; gynobase pyramidal or flat.
Corolla tubular with a well developed campanulate or funnelform throat, tube surpassing calyx-lobes; nutlets usually smooth, attached basally or suprabasally.....46. *Mertensia.*
Corolla salverform, throat not differentiated, tube usually shorter than calyx-lobes; nutlets usually rough, attached ventrally suprabasally or medially.
Calyx somewhat accrescent, reflexed in age; corolla-tube exceeding nutlets; style very much surpassing nutlets.....47. *Anoplocaryum.*
Calyx practically non-accrescent, not reflexed; corolla-tube surpassed by calyx; style little if at all surpassing nutlets.....48. *Plagiobothrys.*

30. **Brachybothrys** Maxim. in Oliver, Hook. Icones xiii. 43, t. 1254 (1878).

With a single species, *B. paridiformis* Maxim., in southern Manchuria and adjacent Korea. Evidently a close ally of *Trigonotis*, and like it to be included in the *Eritrichieae*. It differs from its relative in its open subrotate corollas, conspicuously protruded stamens, and coarse habit.

31. **Trigonotis** Stev. Bull. Soc. Nat. Moscou xxiv. pt. 1, 603 (1851).

Endogonia Lindl. Veg. Kingd. ed. 2, 656 (1847).—A genus with a dozen odd species in Asia and temperate Melanasia. Evidently a relative of *Eritrichium*. Though the nutlets appear to be basifixed, morphologically they are attached medially and laterally to a very

depressed gynobase. The decidedly tetrahedral nutlets are very characteristic of this and the preceding genus.

32. **Lappula** Moench, Meth. 416 (1794).

Lapula Gilib. Fl. Lithuan. i. 25 (1781), nom. nud. *Echinospermum* Sw. in Lehm. Asperif. i. 113 (1818). *Rochelia* R. & S. Syst. iv. pg. xi and 108 (1819). *Heterocaryum* A. DC. Prodr. x. 144 (1846). *Cynoglossospermum* [Siegesb.] Kuntze, Rev. Gen. ii. 436 (1891).—A natural, but difficult genus of 30 to 40 closely related species centering in central and southwestern Asia and having outlying species in Europe, Africa, Australia, and America. *Lappula spinocarpa* (Forsk.) Aschers. is aberrant in the arming of its nutlets. These agree with those of typical *Lappula* in size, outline and attachment, but differ in lacking a well defined toothed margin, being instead coarsely and irregularly muricate over the back. The habit of *L. spinocarpa* is so obviously that of the other species of *Lappula* that generic segregation of the species seems quite unacceptable.

The first generic name applied to the genus was that published by Gilibert in his Flora Lithuanica. Though he described the species, *Lapula* [sic!] *echinata* and indicated that it was synonymous with *Myosotis Lappula* L., Gilibert did not describe his genus, nor indicate any character whereby it might be recognized. Hence, according to the International Rules (Art. 38), it is a nomen nudum. The first characterization given the genus was by Moench. Although Gilibert's specific name was launched under a generic name not effectively published, it has, in recent years, been generally accepted for the common European representative of the genus.

33. **Myosotidium** Hook. Bot. Mag. lxxxv. t. 5137 (1859).

A monotype with the single species known only from Chatham Island, New Zealand. *Myosotidium hortensia* (Decne.) Baill. is a very decorative plant, and has its closest relatives in *Selkirkia* of Juan Fernandez and in the widely distributed genus *Hackelia*. Brand, Pflanzenr. iv. Fam. 252, 45 (1921), follows past authors in placing *Myosotidium* in the *Cynoglosseae*, but the erect nutlets and their attachment are clearly those of an *Eritrichiea*.

34. **Hackelia** Opiz in Bercht. Fl. Boehm. ii. pt. 2, 146 (1839).

A genus of 25 to 30 species, most of which occur in western North America. Four species are known from the cooler parts of

Eurasia. The present study of the *Eritrichieae* has only increased my convictions, Contr. Gray Herb. n. s. lxviii. 43 (1923), that *Hackelia* is not immediately related to *Lappula*, but is related rather to *Eritrichium*, and that it merits the generic rank here accorded it.

35. **Eritrichium** Schrad. in Gaud. Fl. Helv. ii. 57 (1828).

Centering in Asia where there are perhaps 12 scarcely separable species. One species occurs on the high mountains of Europe, and several more are known from America. The genus is a natural one, and contains canescent perennial herbs characteristic of bleak plateaus or cold mountain-slopes. In the past the genus was vastly amplified, and at one time contained a large proportion of the *Eritrichieae*. As here defined, however, it is reduced to homogeneity and is a relatively small genus.

36. **Craniospermum** Lehm. Asperif. ii. 336 (1818).

Diploma Schrenk, Bull. Phys.-Math. Acad. St. Petersb. ii. 195 (1844).—A well marked genus with several closely related species in the Altai-Baikal region of Asia.

37. **Microula** Benth. in Benth. & Hook. Gen. Pl. ii. 853 (1876).

Tretocarya Maxim. Bull. Acad. St. Petersb. xxvii. 505 (1881); Mél. Biol. xi. 270 (1881). *Schistocaryum* Franch. Bull. Mens. Soc. Linn. Paris 930 (1891).—As Gray, Proc. Am. Acad. xx. 261 (1884), has suggested, this genus seems very closely related to *Plagiobothrys*. It differs, however, in normally having blue corollas, and at least several of the nutlets of each fruit bearing a characteristic epidorsal annulate crest. Except for the crest, the nutlets are quite indistinguishable from those of *Plagiobothrys* § *Euplagiobothrys*, and it may be that further study will give reasons for reducing *Macroula*. *Schistocaryum* is evidently a synonym. The peculiar dehiscence of the nutlets, which was the justification for proposing the genus, may have been caused by extreme pressure in drying fruiting material. It is to be noted, also, that the author later, Jour. de Bot. v. 105 (1891), admitted, because of habital similarity, other species to his genus which lacked the peculiar dehiscence. The species of *Schistocaryum* have the nutlets of *Microula*, and seem to be close relatives of *M. sikkimensis*. Indeed *S. myosotidium*, the type of its genus, seems so close to *M. sikkimensis* as to throw doubt on their specific distinctness. The following 9 species are referable to *Microula*. They occur

at high altitudes in the Himalayas, in Tibet, and in the mountains of western China.

1. MICROULA TIBETICA Benth. in Benth. & Hook. Gen. Pl. ii. 853 (1876); Maxim. Bull. Acad. St. Petersb. xxvi. 501 (1880); Mél. Biol. x. 682 (1880); Hemsley in Hook. Icon. xxvi. t. 2562 (1898); Hemsley, Jour. Linn. Soc. xxxv. 192 (1902). *M. Benthami* Clarke in Hook. Fl. Brit. India iv. 167 (1883); Oliver in Hook. Icon. xxiii. t. 2257 (1893). *Tretocarya pratensis* Maxim. Bull. Acad. St. Petersb. xxvii. 505 (1881); Mél. Biol. xi. 272 (1881).—Tibet and adjacent Himalayas.

2. M. TANGUTICA Maxim. Bull. Acad. St. Petersb. xxvi. 500 (1880); Mél. Biol. x. 682 (1880).—Northwestern China. Doubtfully distinct from *M. tibetica.*

3. M. PUSTULATA (Clarke) Duthie, Kew Bull. 1912, pg. 39 (1912). *Eritrichium pustulatum* Clarke in Hook. Fl. Brit. India iv. 164 (1883). —Himalayas.

4. M. SIKKIMENSIS (Clarke) Hemsley in Hook. Icon. xxvi. sub t. 2562 (1898). *Anchusa sikkimensis* Clarke in Hook. Fl. Brit. India iv. 168 (1883). *Tretocarya sikkimensis* Oliver in Hook. Icon. xxiii. t. 2255 (1893).—Himalayas and adjacent Tibet.

5. **M. myosotidea** (Franch.), comb. nov. *Schistocaryum myosotideum* Franch. Bull. Mens. Soc. Linn. Paris 930 (1891).—Yunnan.

6. **M. ciliaris** (Bur. & Franch.), comb. nov. *Schistocaryum ciliare* Bur. & Franch. Jour. de Bot. v. 105 (1891).—Szechwan.

7. **M. ovalifolia** (Bur. & Franch.), comb. nov. *Schistocaryum ovalifolium* Bur. & Franch. Jour. de Bot. v. 105 (1891).—Szechwan.

38. **Myosotis** L. Sp. Pl. 131 (1753); Gen. Pl. 63 (1754).

Scorpioides Gilib. Fl. Lithuan. i. 20 (1781). *Exarrhena* R. Br. Prodr. 495 (1810). *Strophiostoma* Turcz. Bull. Soc. Nat. Moscou xiii. pt. 2, 258 (1840).—A cosmopolitan genus of about 50 species, having two important distributional centers, one in Europe and the other in New Zealand. Attempts have been made to segregate, as a genus *Exarrhena,* those New Zealand species having large flowers and conspicuous stamens. As Cheeseman, Man. N. Zealand Fl. 458 (1906), has indicated, however, there appear to be no characters whereby this segregation can be sharply and naturally made. The large-flowered New Zealand species are clearly related to the European ones, having quite similar nutlets, nutlet-attachment, style, corolla-attachment, uncinate pubescence, and frequently even the same habit, and since there are undoubted transitional forms it seems best to treat *Exarrhena* as a section of *Myosotis.* *Myosotis sparsiflora* Mikan

and allies have been grouped to form the genus *Strophiostoma*, characterized by its conspicuous exserted strophiole. Though well developed in *Strophiostoma*, the character is somewhat developed in many species of true *Myosotis*. This tendency towards a strophiolate condition is very suggestive of the *Anchuseae*, and it is a notable fact that the only other member of the subfamily with contorted corolla-lobes (i.e., *Trigonocaryum*) has been placed in that tribe. *Myosotis*, however, does not have a habit at all suggestive of the *Anchuseae*, nor a tumid rim surrounding the nutlet-attachment, while furthermore its habit, somewhat margined nutlets, and peculiar solitary stigma make it much more at home in the *Eritrichieae*. Because of its practically basally attached nutlets, the genus in the past has been referred to the *Lithospermeae*, but its habit, compressed slightly margined nutlets, solitary disciform stigmas, and blue corollas seem to indicate stronger affinities in the *Eritrichieae*.

39. **Microcaryum**, gen. nov.

Calyx 5-fidus, lobis angustis, fructifer immutatus. Corollae tubus cylindricus calyce paulo brevior, fauce fornicibus 5 emarginatis clausa, lobi 5 ovati imbricati obtusi breves patentes. Stamina 5 tubo affixa inclusa, filamentis brevibus et antheris ovatis minimis obtusis. Ovarii lobi 4 in gynobasi elongata laterales, stylus inter lobos brevis, stigmate subcapitato, ovula lateraliter affixa. Nuculae 4 erectae immarginatae dorso convexae rugosae et tuberculatae medie longitudinaliter carinatae ventre obtusae medie sulcatae sulco longitudinali basi divaricatim furcato ab ima basi fere ad medium gynobasi columnari affixae. Semina recta, cotyledones planae indivisae.—Herba annua pernana himalayana villosa. Folia alterna oblanceolata obtusa. Inflorescentia pseudo-umbellata, floribus in fasciculos plures spicate dispositis. Corolla alba minima hypocraterimorpha. Pedicellae elongatae erectae. (Name from μικρός, *small*, and κάρυον, *nut*, in reference to the minute size of the nutlets.)

Although it has been associated with *Eritrichium*, this monotype is not at all closely related there, appearing rather to have its closest affinities in *Cryptantha*. *Microcaryum* differs from *Eritrichium* in habit, inflorescence, and in the shape and attachment of its nutlets. It agrees with *Cryptantha* in all floral and fruiting structures, and has quite similarly shaped and attached nutlets, but differs, however, in its habit, falsely umbellate inflorescence, villous pubescence, and widely separated range. *Microcaryum* occurs at very high altitudes in the Himalayas and adjacent Tibet, whereas *Cryptantha* grows on

the deserts and warm mountain-slopes at relatively low altitudes, from Alaska to Mexico, and Peru to Chile.

Microcaryum pygmaeum (Clarke), comb. nov. *Eritrichium pygmaeum* Clarke in Hook. Fl. Brit. India iv. 165 (1883). *E. Riae* Winkl. in Fedde, Repert., Beiheft. xii. 473 (1922).

40. **Amblynotus**, gen. nov.

Calyx 5-fidus, lobis angustis elongatis, fructifer paullo accrescens. Corollae hypocraterimorphae tubus brevis calyce brevior, fauce fornicibus 5 obtusis clausa; lobi 5 imbricati obtusi patentes. Stamina 5, tubo affixa inclusa, filamentis brevibus; antherae oblongae obtusae. Ovarii lobi 4 in gynobasi pyramidali erecti; stylus inter lobos brevis; stigmate subcapitato disciformi; ovula erecta. Nuculae 4 erectae emarginatae, dorso convexae obscure rugulosae nitidae glaberrimae, ventre basin versus cum areola triangulari obliqua instructae supra areolam secus angulum interiorem sulcatulae. Semina recta; cotyledones planae indivisae.—Herba perennis asiatica caespitosa sericovillosa strigosa. Folia alterna obtusa oblanceolata. Racemi simplices bracteati. Corolla coerulea.—*Eritrichium* § *Amblynotus* A. DC. Prodr. x. 128 (1846).

Amblynotus has been confused with *Eritrichium* which it somewhat suggests in habit and pubescence, but from which it differs in the attachment and form of its nutlets, since these are suprabasally attached by an areola which is prolonged above into a usually closed groove, and are polished and rounded and quite lack any suggestion of the dorsal marginal crests characteristic of *Eritrichium*. The proposed genus is probably related to *Cryptantha*, though not very closely so, differing in habit and pubescence, as well as in the color and texture of the corolla. *Amblynotus* seems to be a very distinct genus well worthy of recognition. It surely can not be left in *Eritrichium* if the latter is to be naturally defined.

Amblynotus obovatus (A. DC.), comb. nov. *Eritrichium oboratum* A. DC. Prodr. x. 128 (1846); Ledeb. Fl. Ross. iii. 152 (1847–9); Herder, Act. Hort. Petrop. i. 540 (1872). *Myosotis obovata* Ledeb. Fl. Altaica i. 190 (1829).

41. **Megastoma** Coss. & Dur. in Bonn. & Barr. Cat. Pl. Tunis 301 (1896).

A single species, *M. pusillum* Coss. & Dur., occurring in Algeria and Tunis. Although referred to *Eritrichium* by Bentham & Hooker, Gen. Pl. ii. 851 (1876), it is not at all closely related to that genus

though it does approach *Cryptantha* which Bentham & Hooker also reduced to *Eritrichium*. *Megastoma* differs from *Cryptantha* in its nude, unappendaged corolla-throat, very irregular calyx, and opposite branching; and of course has a widely separated range. A beautiful illustration of the plant has been given by Bonnet & Barratte, Ill. Phaner. Tunis t. 11, fig. 4–11 (1895).

42. **Rochelia** Reichb. Flora vii. 243 (1824); Icon. Crit. ii. 13, t. 123 (1824).

Maccoya F. Muell. Fragm. Austr. i. 127 (1859).—An anomalous genus of 10 to 15 species, centering in southwestern Asia and ranging from central Asia to the Mediterranean Basin. One species occurs in Australia. Although properly placed in the tribe *Eritrichieae* by Bentham & Hooker, Gen. Pl. ii. 836 (1876), Gürke, E. & P. Pflanzenf. iv. Abt. 3, 131 (1895), associated it with the American genus *Harpagonella* to form the tribe *Harpagonelleae*. A study of the nutlets and their attachment in *Harpagonella* and *Rochelia* should convince anyone that Gürke's tribe is clearly an artificial association of two only distantly related, anomalous, biovulate annuals. *Rochelia* fits clearly and naturally into the *Eritrichieae*, probably nearest *Lappula*, but *Harpagonella*, as pointed out on another page, is a *Cynoglosseae*. The correct combination for the Australian species of *Rochelia* appears to never have been made.

Rochelia plurisepalea (F. Muell.), comb. nov. *Maccoya plurisepalea* F. Muell. Frag. Austr. i. 127 (1859). *R. Maccoya* F. Muell. in Benth. Fl. Austr. iv. 408 (1869).

43. **Oreogenia**, gen. nov.

Calyx 5-fidus, lobis angustis, fructifer immutatus. Corollae tubus cylindricus intus infra medium transverse plicatus, calyci subaequalis; fauce fornicibus 5 obtusis clausa; lobi 5 orbiculares imbricati obtusi breves patentes. Stamina 5 tubo affixa inclusa, filamentis brevibus; antherae ovatae minimae obtusae. Ovarii lobi 4, in gynobasi elongata erecti; stylus inter lobos brevis, stigmate truncato plano vel concavo; ovula lateraliter affixa. Nuculae 4 lanceolatae immarginatae erectae, in facie interiori longitudinaliter carinatae carina ab ima basi fere ad apicem gynobasi columnari firmiter affixae, dorso rugosae strigoso-hispidulosae convexae medie carinatae. Semina recta; cotyledones planae indivisae.—Herba annua pumila villosa himalayana. Folia alterna obtusa oblanceolata. Racemi bracteati. Corolla coerulea.—(Name from ὄρος, *mountain*, and γενεά, *birth*.)

An Himalayan monotype which has been mistakenly referred to *Eritrichium*, a genus which is obviously not a close relative and which differs much in its perennial habit and margined broadly attached nutlets. The nutlets of *Oreogenia* are attached along the length of the keeled inner face.

Oreogenia Munroi (Clarke), comb. nov. *Eritrichium Munroi* Clarke in Hook. Fl. Brit. India iv. 165 (1883). *E. densiflorum* Duthie, Kew Bull. 1912, pg. 39 (1912).

44. **Chionocharis**, gen. nov.

Calyx 5-partitus, lobis lineari-spathulatis, fructifer immutatus. Corollae tubus calyci subaequalis, fauce fornicibus 5 obtusis clausa; lobi 5 imbricati obtusi patentes. Stamina 5 tubo affixa inclusa, filamentis brevibus; antherae ovatae obtusae. Ovarii lobi 4 in gynobasi pyramidali erecti; stylus inter lobos brevis, stigmate disciformi mucronato; ovula erecta. Nuculae 4 vel abortu pauciores erectae immarginatae strigoso-pubescentes dorso convexae laeves ventraliter obtusae cum areola parva triangulari supra basin ornatae. Semina recta, cotyledones planae indivisae.—Herba perennis himalayana pulvinata. Folia alterna numerosissima confertissime imbricata obtusa lata. (Name from χιών, *snow*, and χάρις, *beauty*.)

A remarkably distinct monotype of the Himalayas. The species has passed as a *Myosotis*, and indeed it does suggest in gross habit such New Zealand species as *M. uniflora* Hook. and *M. pulvinaris* Hook., but it is readily distinguished by its spathulate calyx-lobes, imbricate corolla-lobes, and laterally (suprabasally) affixed lanceolate very pubescent nutlets.

Chionocharis Hookeri (Clarke), comb. nov. *Myosotis Hookeri* Clarke in Hook. Fl. Brit. India iv. 174 (1883).

45. **Asperugo** L. Sp. Pl. 138 (1753); Gen. Pl. 67 (1754).

A European monotype now widely disseminated as a weed. The plicate accrescent calyces of this plant are highly characteristic, and its nutlets also distinctive. The latter are strongly flattened with the small circular areola placed above the middle and clearly to one side of the medial line. The gynobase is strongly compressed.

46. **Mertensia** Roth, Cat. Bot. i. 34 (1797).

Pneumaria Hill, Veg. Syst. vii. 40 (1764). *Casselia* Dumort. Comment. Bot. 21 (1822). *Steenhammerea* Reichb. Fl. Germ. Excur.

i. 337 (1831). *Platynema* Schrad. Ind. Sem. Hort. Goetting. (1835); Linnaea Litt. (1837) 89. "*Winkleria* Reichb. Nom. 236 (1841)." *Hippoglossum* Hartm. ex Lilja. Linnaea xvii. 111 (1843). *Orocharis* Lindl. Veg. Syst. ed. 2, 656 (1847). *Cerinthodes* [Ludw.] Kuntze, Rev. Gen. ii. 436 (1891).—With 50 to 60 species in the temperate portions of Eurasia and North America, most of them in western United States. The genus exhibits a number of diverse trends, which in a few instances have been given generic recognition, e. g. *Pneumaria* for *M. maritima* and allies, and *Orocharis* for the racemose Himalayan species related to *M. echioides*. The recognition of *Pneumaria* would set the generic values too low, and logically compel the recognition of monotypic genera for such species as *M. virginica* (L.) DC., *M. rivularia* DC., *M. bella* Piper, etc. This seems quite inadvisable since *Mertensia* in the broad sense is a natural and readily recognized entity. On account of its usually basifixed nutlets *Mertensia* has been placed in the *Lithospermeae*. Its relations, however, appear to be rather in the *Anchuseae* or the *Eritrichieae*. *Mertensia* has much in common with *Pulmonaria*, in fact the most important difference seems to be the absence on its nutlets of a plug-shaped strophiole surrounded by a tumid rim. On account of this difference, and because the nutlets are frequently attached obliquely or suprabasally by a flat areola, as well as from its abundance in western North America,—a region without any indubitable native anchusoid borages, I have thought it best to place the genus in the *Eritrichieae*. The style of *Mertensia* is almost always single.

47. **Anoplocaryum** Ledeb. Fl. Ross. iii. 154 (1847).

A monotype known only from Transbaikalia. The genus has received practically no recognition since its publication, being considered at most only a section of *Eritrichium* or *Echinospermum*. It is certainly distinct, however, from *Eritrichium* and *Echinospermum* since it has a very different habit, glabrate herbage, firm reflexed calyces, and unmargined and very differently attached nutlets. *Anoplocaryum compressum* (Turcz.) Ledeb. appears to be a close ally of *Mertensia*, from which it differs in the corolla-shape and nutlet-attachment.

48. **Plagiobothrys** Fisch. & Mey. Ind. Sem. Hort. Petrop. ii. 46 (1835).

Allocarya Greene, Pittonia i. 12 (1887); Johnston, Contr. Gray Herb. n. s. lxviii. 64 (1923). *Harilandia* Stapf, Trans. Linn. Soc.

ser. 2, Bot. iv. 209 (1894).—A very large American genus with a few representatives in the Old World. Of the section *Allocarya* there are two species within our limits, one in Australia and another in Kamchatka, the former probably derived from South America and the latter evidently from North America. A careful study of *Havilandia* has convinced me that its species, which occur at high altitudes in the East Indian Islands, should be placed under *Plagiobothrys*. If these species had opposite lower leaves they would be referable to the section *Allocarya*, since they have sheathing leaf-bases like many members of that section, and nutlets which in shape and attachment are indistinguishable from it. The nutlets are smooth, but so are those of *P. lithocaryus* and several other species. The resemblance in gross habit between *Havilandia borneensis* Stapf and *P. linifolius* is remarkable, cf. HBK. Nov. Gen. et Sp. iii. t. 200 (1818) (as *Anchusa oppositifolia*), and Stapf, l. c., t. 16a (1894). The Havilandias have been referred to *Lithospermum*, but they are obviously of the *Eritrichieae* and of the above mentioned relationship.

§ Allocarya (Greene) Johnston.—Leaves opposite, at least toward root, usually somewhat sheathing; flowers axillary or in spicate racemes; nutlets usually with a suprabasal non-carunculate areola.

1. Plagiobothrys australasicus (A. DC.) Johnston, Contr. Gray Herb. n. s. lxviii. 66 (1923). *Eritrichium australasicum* A. DC. Prodr. x. 134 (1846); Benth. Fl. Austral. iv. 406 (1869). *Allocarya australasica* Greene, Erythea iii. 57 (1895). *Heliotropium elachanthum* F. Muell. Linnaea xxv. 424 (1852).—Southern Australia.

2. **P. asiaticus** (Kom.), comb. nov. *Allocarya asiatica* Kom. in Fedde, Repert. xiii. 236 (1914). *Eritrichium plebejum* var. *tenue* Herder, Act. Hort. Petrop. i. 542 (1872).—Kamchatka.

§ Havilandia (Stapf) Johnston.—Leaves alternate, broadly attached and somewhat sheathing; flowers axillary; nutlets with suprabasal, small, non-carunculate areola.

3. **P. borneensis** (Stapf), comb. nov. *Havilandia borneensis* Stapf, Trans. Linn. Soc ser. 2, Bot. iv. 209, t. 16a (1894). *Lithospermum borneense* Boerl. Handl. Fl. Nederl. Ind. ii pt. 2, and 488 (1899); Merrill, Enum. Born. Pl. 511 (1921).—British North Borneo.

4. **P. minutus** (Wernh.), comb. nov. *Lithospermum minutum* Wernh. Trans. Linn. Soc. ser. 2, Bot. ix. 118 (1916).—Dutch New Guinea.

5. **P.** (?) **Zollingeri** (A. DC.), comb. nov. *Lithospermum Zollingeri* A. DC. Prodr. x. 587 (1846); Miquel, Fl. Ind. Batav. ii. 930 (1857); Boerl. Handl. Fl. Nederl. Ind. ii. pt. 2, 485 and 488 (1899); Koorder, Exkur. Fl. Java iii. 131 (1912).—Java. This is evidently not a

Lithospermum, and though the habit of growth and elongate corolla-tube are different from those of indubitable Havilandias, it seems best referred to *Havilandia* until good fruiting material becomes available.

Cynoglosseae.

Nutlets ascending or divergent or rarely even inverted (*Harpagonella* and *Bothriospermum*) or suberect, straight or slightly bent appendaged or verrucose or smooth, usually margined; areola lateral to apical, near the radicle, unmargined, without strophiole; gynobase columnar or pyramidal or flat; style entire; stigma 1, capitate; corolla blue or white.—The most highly evolved tribe in the subfamily if not in the family. Its outstanding features are adradicular nutlet-attachment and commonly appendaged or margined nutlets. Although cosmopolitan in distribution it centers in southwestern Asia and the eastern Mediterranean Basin. *Harpagonella*, the most evolved member of the tribe, comes from western North America. There are only three endemic American genera of this tribe; they are *Mimophytum*, *Pectocarya*, and *Harpagonella*.

Key to Genera of Cynoglosseae.

Apex of anthers subulate and contorted.
- Corolla-throat unappendaged.....49. *Trichodesma*.
- Corolla-throat with ten intruded triangular appendages.....50. *Lacaitaea*.

Apex of anthers obtuse or apiculate, not subulate and contorted.
- Anthers strongly heteromorphous, the upper one several times larger than others.....51. *Caccinia*.
- Anthers homomorphous, all of equal size.
  - Gynobase inflated, globose; nutlets with entire inner face permanently affixed to gynobase, only one maturing...52. *Suchtelenia*.
  - Gynobase solid, flat or pyramidal or subulate; nutlets with ventral face only partially affixed to gynobase, deciduous, usually several maturing.
    - Nutlets with straight or uncinate unicellular hairs, never tuberculate nor with multicellular glochidiate appendages, rarely smooth and glabrous but then always with stamens included.....53. *Omphalodes*.
    - Nutlets with some multicellular glochidiate appendages or evidently tuberculate, rarely smooth and glabrous but then with stamens always exserted.
      - Nutlets covered with glochi liate appendages, marginless or with a weakly developed margin that is thick and glochidiate or is evidently formed by the basal fusion of the lateral appendages.....54. *Cynoglossum*.
      - Nutlets with very few glochidiate appendages or surface tuberculate or even smooth, with a well developed rather wide cartilaginous margin (this tumid in *Bothriospermum*).
        - Stamens exserted; fruit smooth and glabrous or nearly so.

Corolla cylindrical with erect lobes; attachment-face of nutlets free above and decurrent on the style; Eurasian. ..... 55. *Rindera.*
Corolla salverform, lobes divergent; attachment-face of nutlets sessile, not decurrent ..... 56. *Tysonia.*
Stamens included; fruit evidently tuberculate or glochidiate.
Nutlets with a small apical or subapical attachment.
Nutlets tuberculate, with a double margin.
Nutlets inverted, parallel, with backs proximate, margin low, tumid and inconspicuous. ..... 57. *Bothriospermum.*
Nutlets divergent, with backs upturned, margins conspicuous, well developed.. 58. *Thyrocarpus.*
Nutlets glochidiate, with a single margin.... 59. *Actinocarya.*
Nutlets with an elongate lateral attachment, commonly decurrent on style, rarely tuberculate, margin single. ..... 60. *Paracaryum.*

49. **Trichodesma** R. Br. Prodr. 496 (1810).

Pollichia Meaic. Bot. Beobacht. 247 (1783). *Borraginoides* Moench, Meth. 515 (1794). *Friedrichsthalia* Fenzl in Endl. Nov. Stirp. Dec. 53 (1839). *Leiocarya* Hochst. Flora xxvii. 30 (1844). *Streblanthera* Steud. in Hochst. Flora xxvii. 29 (1844). *Spiroconus* Stev. Bull. Soc. Nat. Moscou xxiv. pt. 1, 576 (1851). *Boraginella* [Siegesb.] Kuntze, Rev. Gen. ii. 435 (1891).—About 40 species in the warmer parts of Asia, Africa, and Australia. The genus has been recently monographed by Brand, Pflanzenr. iv. Fam. 252, 19–44 (1921).

50. **Lacaitaea** Brand in Fedde, Repert. xiii. 81 (1914).

A single species, *L. calycosa* (Coll. & Hemsley) Brand, in the eastern Himalayas. I know the genus only from the literature. The latest discussion of it is that given by Brand, Pflanzenr. iv. Fam. 252, 44 (1921).

51. **Caccinia** Savi, Cose Bot. 1, t. 1 (1832).

Anisanthera Raf. Fl. Tell. iii. 80 (1836). *Heliocarya* Bunge, Helioc. 4 (1871).—About 7 species in western Asia. *Heliocarya* has been maintained as a monotypic genus, but its relations with *Caccinia* are patent and its distinguishing characters are merely the culmination of trends well developed in that genus. These facts seem to justify the following combination.

Caccinia monandra (Bunge), comb. nov. *Heliocarya monandra* Bunge, Helioc. 4 (1871); Brand, Pflanzenr. iv. Fam. 252, 94 (1921).

52. **Suchtelenia** Karelin in Meissn. Gen. i. 279; ii. 188 (1840); Bull. Soc. Nat. Mosc. 16, t. 2 (1841).

A monotype of the southern Caspian Sea basin. An anomalous plant with a narrowly ovoid, inflated gynobase. The nutlets, several of which are usually aborted, are borne with their inner face entirely adnate to the hollow gynobase. The best description of the genus is that given by Popow in the Flora Caucasica Critica, iv. pt. 2, 101 (1913). The description and analytic figures given by Brand, Pflanzenr. iv. Fam. 252, 161, fig. 22 (1921), are misleading.

53. **Omphalodes** [Tournef.] Moench, Meth. 419 (1794).

Picotia R. & S. Syst. iv. x (1819). *Omphalium* Roth, Enum. Pl. Germ. i. 590 (1827).—About 24 species in Eurasia and Mexico. *Omphalodes scorpioides* has a strongly recurved radicle, opposite lower leaves, and may be worthy of generic recognition, though no special generic name has ever been associated with it.

54. **Cynoglossum** [Tournef.] L. Sp. Pl. 134 (1753); Gen. Pl. 65 (1754).

Solenanthus Ledeb. Icon. Fl. Ross. i. 8, t. 26 (1829). *Lindelofia* Lehm. Hamb. Gart. u. Blumenzeitung vi. 351 (1850). *Anchusopsis* Bisch. Del. Sem. Hort. Heidelberg. 8 (1852). *Trachelanthus* Kunze, Bot. Zeitung viii. 665 (1850). *Kuschakewiczia* Regel & Smirnow, Act. Hort. Petrop. v. pt. 2, 625 (1878). *Adelocaryum* Brand in Fedde, Repert. xiii. 547 (1915).—A cosmopolitan genus of 80 to 90 species, with the center of distribution in southern Europe and Asia. The species with exserted stamens have been segregated to form the genus *Solenanthus*, but this staminal difference is developed in various degrees and is not correlated with any character of corolla, fruit, or habit, these latter characters, in fact, being the exact duplicates of those found in *Cynoglossum*. In *Lindelofia* the stamens are barely extruded, thereby showing unmistakable transition between the staminal developments characteristic of *Solenanthus* and *Cynoglossum*. Brand separates *Lindelofia*, and the obviously related *Adelocaryum*, from *Solenanthus* and *Cynoglossum* by attributing to the two former, nutlets which touch one another while in the bud, and to the two latter, nutlets which are separated from the beginning. These characters are not only very difficult to use, but in most instances are inconclusive, and I am convinced that the supposed differences are not of particular phylogenetic importance. No attempt is made here to put on record the numerous combinations rendered necessary by

this amplification of the generic limits of *Cynoglossum*, but the following species, incorrectly referred to *Paracaryum*, may be transferred.

Cynoglossum Thomsoni (Clarke), comb. nov. *Paracaryum Thomsoni* Clarke in Hook. Fl. Brit. India iv. 161 (1883).

55. **Rindera** Pallas, Reise i. 486 (1771).

Mattia Schult. Obs. Bot. 30 (1809). *Cyphomattia* Boiss. Fl. Orient. iv. 272 (1875). *Bilegmum* Brand in Fedde, Repert. xiii. 549 (1915).—About 15 species, most of them in western Asia and adjacent Europe.

56. **Tysonia** Bolus in Hook. Icon. xx. t. 1942 (1890).

A South African monotype which is unrepresented in the Gray Herbarium. The plant originally figured by Bolus has peculiar subdisciform, unarmed, and winged nutlets, characters which, substantiated by the odd corolla-developments, seems to furnish ample justification for the recognition of the genus. The plant described and figured by Brand, Pflanzenr. iv. Fam. 252, 88, fig. 11 (1921) is obviously quite different in fruiting structures, having the depressed, broadly ovoid, densely glochidiate, wingless nutlets of a *Cynoglossum*.

57. **Bothriospermum** Bunge, Enum. Pl. China Bor. 47 (1835).
See Roy. Soc. Cat.

A well-marked genus of 3 to 4 species, all of them occurring in China and one of them ranging from northern India to Manchuria and on the Japanese, Philippine, Mascarene, and Hawaiian islands. Though this genus has been placed in the *Eritrichieae* it seems clear that its proper position is in the *Cynoglosseae* next to *Thyrocarpus*. *Bothriospermum* and this relative are remarkably similar in general habit and in floral structures, in fact appear to differ only in the direction of their nutlets and in the degree to which the dorsal margining is developed on the latter. The two genera agree in having the attachment-surface of their verrucose nutlets proximate to the radicle end of the seed, or in other words have nutlets morphologically apical in attachment. In *Thyrocarpus* the nutlets are divergent, but in *Bothriospermum* they are inverted, parallel and with their backs together. In *Bothriospermum* the peculiar scar above the nutlet-attachment, which has been frequently mistaken for the real attachment-scar, is, hence, morphologically the equivalent of the dorsal cupulate structure on the nutlets of *Thyrocarpus*. The tumid margin of the scar on the back of the nutlets of *Bothriospermum* is the homologue of the outer lobed dorsal margin on the nutlets of *Thyrocarpus*,

and the cartilaginous veil within the tumid rim is the homologue of the inner one of the double margin of *Thyrocarpus*. The cartilaginous veil, well developed in *Bothriospermum*, is also present, but early evanescent, in numerous species of *Omphalodes* and *Paracaryum*.

58. **Thyrocarpus** Hance, Ann. Sci. Nat. ser. 4, xviii. 225 (1862).

A chinese genus of 3 species.

59. **Actinocarya** Benth. in Benth. & Hook. Gen. Pl. ii. 846 (1876).

An interesting monotype from Tibet. According to Brand, Pflanzenr. iv. Fam. 252, 15 (1921), this genus is to be excluded from the *Cynoglosseae* and associated with *Myosotis*, since its nutlets are said to be basifixed. My dissections of the type collection agree with the details in the plate given by Oliver, Hook. Icon. xxiii. t. 2257 (1893), and clearly point to a relationship in the *Cynoglosseae*. Not only do the nutlets bear glochidiate appendages and a coroniform dorsal crest suggestive of the *Cynoglosseae*, but the radicle end of the seed is next to the attachment-surface of the nutlet and, hence, the latter is unquestionably apical in attachment.

60. **Paracaryum** (A. DC.) Boiss. Diag. Pl. Orient. ser. 1, xi. 128 (1849).

Mattiastrum Brand in Fedde, Repert. xiv. 150 (1915).—With 40 to 45 species in the area between the eastern Mediterranean Basin and India. There seems to be no marked difference between *Paracaryum* and *Mattiastrum*.

2. Notes on miscellaneous American Boraginaceae.

Cryptantha latifolia, sp. nov., annua laxe ramosa 7–30 cm. alta; ramis breviter graciliterque hispido-strigosis et sparse setosis; foliis subdistantibus firmis oblongo-linearibus vel oblongis obtusis integerrimis 1–3.5 cm. longis 2.5–8(–10) mm. latis sessilibus concoloribus pustulato-setosis; spicis solitariis vel geminatis pauci- vel multibracteatis 3–12 cm. longis unilateralibus; floribus juventate congestis biseriatis maturitate remotis; calycibus maturitate ovoideis subsessilibus ascendentibus 2–4 mm. longis, lobis linearibus vel linearioblongis obtusis breviter hirsutis; corolla conspicua calycem multo superanti 2.5–5 mm. lata, lobis late obovatis 1.2–1.8 mm. longis albis; nuculis 4 triangulari-ovatis compressis fuscescentibus homomorphis

1.5–1.7 mm. longis apice acutis basi rotundo-truncatis dorso muricatis ventre verrucosis apice acutis, sulcis clausis vel infra medium anguste apertis basin versus divaricate furcatis; gynobasi quadrangulari-columnari ca. 1 mm. alta; stylo ca. 1 mm. longo nuculam ca. 0.5 mm. superanti.—PERU: loose stony upper slopes of sea-side hills, Chorrillos near Lima, about 150 m. alt., Sept. 15, 1923, *Macbride 5861* (TYPE, Field Mus. no. 536,865; ISOTYPE, Gray Herb.).—Differing from *C. limensis* (A. DC.) Johnston in its broad rotate corollas that much surpass the calyces, broad leaves, larger calyces, and acute ovate muricate nutlets that are about half the length of the calyx. From the briefly described *C. granulosa* (R. & P.) Johnston it differs in its broad leaves, loosely branched habit and muricate nutlets.

Cryptantha Macbridei, sp. nov., annua basaliter ramosa 5–15 cm. alta; ramis paucis ascendentibus adpresse hispidis; foliis oblanceolatis firmis integerrimis sessilibus saepe acutis 1–2 cm. longis 2–3 mm. latis saepe pustulato-setosis, superioribus reductis, inferioribus oppositis majoribus; spicis solitariis vel geminatis 3–12 cm. longis unilateralibus; floribus obscure biseriatis omnibus angusto-bracteatis maturitate 2–5 mm. separatis; calycibus fructiferis oblongis subsessilibus ascendentibus vel divaricatis 4–5.5 mm. longis basi conicis; lobis calycis oblanceolatis vel linearibus saepe acutis in costa infra medium cum setis flavescentibus horridis in marginibus adpresse hispidis, supra medium herbaceis paullo hispidis saepe recurvatis vel ascendentibus; corolla tubulosa calyce vix longiori ca. 2 mm. longa, lobis orbicularibus erectis ca. 0.5 mm. longis; nuculis 4 ovato-lanceolatis ca. 1.5 mm. longis fuscescentibus subnitidis verrucosis heteromorphis margine obtusis apice anguste acutis basi rotundatis ventre 3/5 longitudinis ad gynobasem quadrangulari-columnarem 1–1.2 mm. longam adfixis, sulcis clausis vel anguste apertis basi in areolam deltoideam semper dilatatis; nucula axillari persistenti dorso basin versus laeve quam nuculae consimiles sublongiori.—PERU: loose stony upper slopes of seaside hills, Chorrillos near Lima, about 150 m. alt., Sept. 15, 1923, *Macbride 5869* (TYPE, Field Mus. no. 536,873; ISOTYPE, Gray Herb.).—Collected with and somewhat resembling *C. latifolia*, but differing in its small tubular corollas, coarsely hirsute calyx-lobes with spreading herbaceous tips, and narrower verrucose heteromorphous nutlets. From the description of *C. limensis*, of which it appears to be a very close relative, it differs in its much larger (4–5 not 3 mm. long) calyces, spreading calyx-lobes, and verrucose nutlets.

Cryptantha peruviana, sp. nov., annua grisea subsimplex vel laxe ramosa 10–20 cm. alta adpresse villoso-hispida inconspicue pustulata; ramis gracilibus ascendentibus; foliis lanceolato-linearibus vel lineari-

bus ascendentibus integerrimis sessilibus acutis 1–3 cm. longis 1–2.5 mm. latis adpresse villoso-hispidis costa et marginibus hispido-ciliatis supra viridioribus, superioribus paullo reductis; spicis saepe evidenter geminatis rare ternatis vel solitariis ebracteatis 1–5 cm. longis unilateralibus; floribus uniseriatis maturitate 2–5 mm. separatis; calycibus fructiferis ovoideis sessilibus ascendentibus 2–4 mm. longis, lobis erectis linearibus vel lanceolato-linearibus in costa cum setis flavescentibus crassis pungentibus ornatis et in marginibus hispido-villosis; corolla tubulosa quam calyx sublongiori ca. 2 mm. longa, lobis orbicularibus ca. 0.3 mm. longis; nuculis 4 (rare 1–2 abortis) ca. 1.5 mm. longis lanceolato-ovatis compressis acutis pallidis rugoso-verrucosis dense minuteque granulatis quam lobi calycis 3/5 brevioribus homomorphis margine acutis basi truncatis ventre $\frac{1}{2}$ longitudinis ad gynobasem quadrangulari-columnarem ca. 1 mm. longam affixa, sulcis apertis vel clausis; stylo ca. 0.6 mm. longo nuculas subsuperanti. —PERU: in loose rocks on dry slopes above Rio Blanco, about 3600 m. alt., May 8–19, 1922, *Macbride & Featherstone 674* (TYPE, Field Mus. no. 517,202; ISOTYPE, Gray Herb.); ravines and hillsides on southern slopes of El Chachani, north of Arequipa, alt. 3355 m. March 1920, *Mr. & Mrs. F. E. Hinkley 77* (G).—A very distinct species with an erect habit of growth, short ebracteate spikes, and pale tuberculate rugose nutlets. The five species of *Cryptantha* which are at present known from Peru may be distinguished by aid of the following

KEY TO THE PERUVIAN SPECIES OF CRYPTANTHA.

Corolla at anthesis twice length of calyx, limb broad.
  Leaves oblong-linear or oblong; nutlets muricate or verrucose...*C. latifolia.*
  Leaves linear; nutlets granulose.....*C. granulosa.*
Corolla tubular, always shorter than or barely exceeding calyx.
  Spikes naked, usually geminate; nutlets pale; leaves linear or lance-linear, very obscurely pustulate.....*C. peruviana.*
  Spikes bracteate, usually solitary; nutlets dark; leaves oblong or oblanceolate, conspicuously pustulate.
    Calyx 4–5 mm. long, lobes spreading or recurving above middle; nutlets verrucose.....*C. Macbridei.*
    Calyx 3 mm. long, lobes erect; nutlets granulate.....*C. limensis.*

✓ **Amsinckia hispida** (R. & P.), comb. nov. *Lithospermum hispidum* R. & P. Fl. Peruv. ii. 5 (1799).—Ruiz & Pavon's specific name is the oldest in the genus, and hence should replace *A. angustifolia* Lehm., cf. Contr. Gray Herb. n. s. lxx. 44 (1924). The type of *A. hispida* was collected in the arid belt to the north of Lima, Peru.

Harpagonella Palmeri, var. **arizonica**, n. var., cornibus calycis quam ea formae typicae gracilioribus longioribus ca. 4 mm. longi-

tudine; nuculis paullo grandioribus.—ARIZONA: plains, Lowell, May 3, 1884, *W. F. Parish 162* (TYPE, Gray Herb.); near Tucson, April 1881, *Pringle 363;* Tucson, *Lemmon;* Tucson, 1877, *Greene 1110.*—The plant of Arizona currently referred to *H. Palmeri* Gray differs from that of California and Lower California in having more elongate cornute processes on the fruiting calyx and noticeably larger nutlets. The type of *H. Palmeri,* collected on Guadelupe Island by Palmer in 1875, is quite indistinguishable from the plant of coastal Southern California and adjacent Lower California.

Harpagonella was placed in a special tribe by Gürke, E. & P. Nat. Pflanzenf. iv. Abt. 3a, 130 (1895), and was so treated in a paper of my own, Contr. Gray Herb. n. s. lxx. 5 (1924). A recent detailed study of *Harpagonella,* however, has convinced me that it has been treated with too much dignity, and that it clearly falls into the *Cynoglosseae* next to *Pectocarya* as first indicated by Gray, Proc. Am. Acad. xi. 88 (1876).

Harpagonella has only two ovules. The nutlets which develop from these are somewhat different in shape, attachment, and pubescence. The axial nutlet (that next the distinct calyx-lobes) is pubescent on all faces, and is slightly shorter and more loosely affixed to the gynobase than is the abaxial nutlet. The abaxial nutlet is enclosed by the peculiarly modified abaxial calyx-lobes, and is pubescent only on the face proximate to the axial nutlet. In both nutlets the radicle-end of the seed is next the attachment-end of the nutlet, and hence, morphologically at least, the nutlets are apically attached. It is quite evident, therefore, that the nutlets must stand inverted with their backs juxtaposed. A close examination reveals a margin surrounding the pubescent inwardly facing side of the abaxial nutlet which further suggests that this is, indeed, morphologically the back of the nutlet. The style, gynobase, and corolla, the indurated recurved pedicels, and all the vegetative characters of *Harpagonella* are those of *Pectocarya,* a genus which also has very elongate nutlets apically attached, and hence there seems to be every reason for returning to the treatment of Gray, l. c., and Bentham & Hooker, Gen. Pl. ii. 846 (1876), placing the genus next to *Pectocarya* and considering it no more than a highly specialized and anomalous member of the *Cynoglosseae.*

PECTOCARYA LATERIFLORA (Lam.) DC. Prodr. x. 120 (1846). *P gracilis,* var. *boliviana* Johnston, Contr. Gray Herb. n. s lxx. 37 (1924).—The study of the material of *Pectocarya,* recently collected by Mr. J. F. Macbride in Peru, has convinced me that *P. gracilis,* var. *boliviana* is synonymous with *P. lateriflora,* since the habit-

difference, by which *P. gracilis* and *P. lateriflora* were distinguished, has proved illusory. The three species constituting the § *Eupectocarya* appear to be remarkably similar in habit, differing only in the shape and arming of the nutlets. *Pectocarya lateriflora* is characterized by its obovate, rather than parallel-sided oblong-linear nutlets, and appears to represent its section in Peru and Bolivia. Weberbauer, Engler & Drude, Veg. Erde xii. 136, fig. 5 (1911), has given a suggestive, but not accurately detailed illustration of *P. lateriflora*.

Cynoglossum limense Willd. Sp. Pl. i. 762 (1798).—This species is based entirely upon a plate and description given by Feuillée, Jour. Obs. Phys. ii. 765, t. 49 (1714), who found the plant in the "vallée d'Ylo." As clearly shown by Feuillée's maps and discussion, the locality known to him as "Ylo" is the same as the port near the southern boundary of Peru now known under that name. The type of *C. limense*, hence, was not collected near Lima as Willdenow's inappropriate specific name, and Brand's statement, Pflanzenr. iv. Fam. 252, 142 (1921), would suggest. As the plant has not been reported from within 500 miles of Ylo it is possible that its reputed occurrence there is the result of some confusion of data.

Cynoglossum Trianaeum Wedd. Chlor. And. ii. 90 (1859).—A fine plate of this was published by Oliver, Hook. Icon. xxv. t. 2458 (1896). Brand, Pflanzenr. iv. Fam. 252, 136 (1921), apparently intended to cite this illustration, but part of his citation has been omitted and the remainder, the plate-number, was added to the citation to Weddell's Chloris Andina.

Cordia gerascanthus L. Syst. ed. 10, 936 (1759); not of Griseb. Fl. Brit. W. Ind. 478 (1861), nor Chodat, Bull. Soc. Bot. Genève ser. 2, xii. 209 (1920). *Gerascanthus* P. Browne Hist. Jamaica 170, t. 29, fig. 3 (1756). *C. gerascanthoides* HBK. Nov. Gen. et Sp. iii. 69 (1818). —In 1910 Urban, Symb. Antil. iv. 516, indicated that, as then used, the binomial, *Cordia gerascanthus* L., was incorrectly applied to the widely distributed tree with canescent, densely stellate calyces, and that the name is properly applicable to the relatively localized species of the West Indies and southern Mexico which has glabrous or sparingly hirsute calyces and larger flowers, and which was described and current as *C. gerascanthoides* HBK. Ten years later, in his paper on *Cordia* § *Gerascanthus*, Chodat, l. c., declared Urban's interpretation of *C. gerascanthus* L. to be incorrect and used the name in the traditional sense, applying it to the widely distributed plant with stellate calyces. Further examination of this matter has recently been made to determine the correct specific name for use by

Dr. W. M. Wheeler in his publications on myrmecophytes. For the convenience of others the results of this study are here put on record.

Cordia gerascanthus L. is based upon the Jamaican plant which Patrick Browne, l. c., described and figured under the name "*Gerascanthus*." Browne's illustration, showing only the floral structures, portrays a corolla of large size which has broad short obtuse lobes with conspicuous pinnate veining, a broad saucer-shaped throat, a stocky weakly ribbed calyx, and deltoid calyx-lobes. These characters definitely associate Browne's plant with *C. gerascanthoides* HBK. and prohibit the use of the Linnean name for the plant with stellate calyces. It is to be also noted that not only does Grisebach, l. c., cite Browne's figure under "*C. gerascanthoides* HBK.," but he gives *C. gerascanthoides* HBK. as "common in the lowlands and mountains" of Jamaica, and gives the plant with stellate calyces (under *C. gerascanthus* Jacq.) as "rare" on that island. Browne's plant was not rare, for he speaks of it as follows, "This tree grows in many parts of Jamaica, and is generally esteemed as one of the best timber woods in the island; it rises to considerable height, . . . , especially in the low-lands, where it is most common, ..." It is significant that concerning the Jamaican occurrence of the plant with stellate calyces, Urban, l. c. (under *C. alliodora* Cham.), comments parenthetically as follows, "fortasse a cl. Wilson introducta ex cl. Stapf. in lit." Since the identity of *C. gerascanthoides* HBK. and *Gerascanthus* Browne is certain from a study of Browne's plate and description, and from distributional considerations, it is evident that *Cordia gerascanthus* L. is, indeed, improperly applied to the widely distributed plant with stellate calyces. Among its close relatives in the West Indies and Central America, *C. gerascanthus* L. is readily recognized by its large flowers, saucer-shaped throat hirsute or glabrescent stout weakly ribbed calyx-tube, and deltoid calyx-lobes. It is known only from Cuba!, Isle of Pines!, Jamaica!, southern Mexico!, and northern Central America. As Urban, Symb. Antil. iv. 516 (1910) and viii. 574 (1921), has pointed out, *Cordia alliodora* (R. & P.) Cham. is the correct name for the widely distributed plant with stellate calyces, or, in other words, for the one incorrectly current as "*C. gerascanthus*." *Cordia alliodora* ranges from Mexico and the West Indies southward along the Andes to Bolivia. A number of critical species, doubtfully distinct from it, have been described from southern Brazil, adjacent Paraguay, and Argentina.

CONTRIBUTIONS FROM THE GRAY HERBARIUM
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BY IVAN MURRAY JOHNSTON.

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MISSOURI BOTANICAL GARDEN
RECEIVED

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THE NORTH AMERICAN SPECIES OF CRYPTANTHA.

The genus *Cryptantha* is a group of annual herbs centering in western America and belonging to the tribe *Eritrichieae* of the family *Boraginaceae*. It has long been recognized as a genus of decided difficulty. This is due both to the variability of its species and to the minute size of the fruiting and floral structures which, as experience has shown, are the only satisfactory basis for precise specific differentiation. In recent years the mass of collected material of this genus has become so large, and the failure of the provisional classification of the earlier authors so patent, that the need of a thorough restudy and reclassification of the group has been increasingly apparent. It is hoped that the present monograph of the North American species will partially meet this obvious need and to some extent bring order out of the chaos that has caused so many botanists to neglect this technical but highly interesting group of West American plants.

Preliminary studies of the North American species of *Cryptantha* were begun by the writer at the University of California in 1920. Intermittently the work has been continued up until the present. During this time many species have been seen in the field and types and critical material have been studied in several of the major herbaria of the United States. The present treatment was prepared at Harvard University and is based upon the material in the Gray Herbarium and the University of California Herbarium, and such other material as has been borrowed during the final critical study of the genus. The mass of material of *Cryptantha* from the herbarium of the University of California has been invaluable, since it is replete with authentic fragments, particularly of the species described by Greene, and since it consists in large part of the critical and extensive accumulations of Mrs. Katherine Brandegee, who was one of the keenest students of the group. The genus having its geographical center in California, the advantages of having available such an extensive and critically assembled representation from that region is apparent, especially so when it is realized that the collection was studied in conjunction with the large general collection, and very numerous types and historical specimens, contained in the Gray Herbarium. In combining the representations of the genus from the two herbaria mentioned over 1500 different specimens were made available for detailed study and comparison during the final review of the genus.

The detailed investigation resulting in this paper was carried on at the Gray Herbarium under the direction of Professor B. L. Robinson who has unstintingly given me of his time and scholarly aid. It is a pleasure here to express my gratitude for his friendly interest and encouragement, and ready aid in matters of perplexing nomenclature and difficult classification. I am also indebted to Professor W. A. Setchell of the University of California, who, in continuation of his many favors, has made it possible for me to restudy in detail the *Cryptantha* material from the University of California Herbarium. For assistance in bibliographic matters relating to this as well as other papers, I wish to express my indebtedness to the late Mary A. Day, Librarian at the Gray Herbarium, and to her successor, Miss Ruth D. Sanderson.

GENERAL DISCUSSION.

History of the Genus.

The generic name *Cryptantha* seemingly first appeared in a seed-list of the Hamburg Botanical Garden published in 1833 by Lehmann,[1] Del. Sem. Hort. Hamb. iv. The next appearance of the name was in a seed-catalogue from the gardens at St. Petersburg published in 1836 by Fischer & Meyer, Ind. Sem. Hort. Petrop. ii. 35. Two Chilean species, *C. glomerata* and *C. microcarpa*, were newly described, but no generic diagnosis was given. The third appearance of the name was in 1837 when these Chilean species appeared under a formal generic diagnosis in George Don's General System of Gardening and Botany, iv. 373. The effective publication of the generic name *Cryptantha*, therefore, dates from Don's General System, since in that work was fulfilled for the first time the requirement of a generic description called for in Art. 38 of the International Rules of Botanical Nomenclature.

The genus *Krynitzkia* was launched in 1841, being fully described in a seed-catalogue from the St. Petersburg gardens published by Fischer & Meyer, Ind. Sem. Hort. Petrop. vii. 52. The genus included a single Californian species, *K. leiocarpa*, transferred from

[1] This publication has not been examined, being apparently unrepresented in North American libraries. As Dr. J. H. Barnhardt has pointed out to me, however, no *Cryptantha* is listed among the six species reported on pages 4 and 5 of the Litteratur-Bericht zur Linnaea für das Jahr 1833 as having been briefly described by Lehmann in the seed-list mentioned, and it seems probable that if the name did appear in 1833, it was merely as a *nomen nudum*. The earliest reference associating the name *Cryptantha* with the Delectus Seminum of 1833 appears to have been that of De Candolle, Prodr. x. 129 (1846).

Echinospermum under which it had been described by the same authors in 1836.

The next important event in the history of the group occurred in 1846 with the appearance of the tenth volume of De Candolle's Prodromus. In this work *Krynitzkia* was kept up, although, except for a few poorly understood species given as doubtful members of *Lithospermum* or *Myosotis*, all species of *Cryptantha* then known were transferred, along with various species of *Plagiobothrys* and *Oreocarya*, to *Eritrichium* § *Cryptantha* (containing only the two original species) and *Eritrichium* § *Rutidocaryum*.

In 1871 Torrey's genus *Piptocalyx* was published by Watson, Bot. King Exped. 240 (1871). It was based upon *Lithospermum circumscissum*, a plant of western United States described by Hooker & Arnott in 1840.

A few years later Gray, Proc. Am. Acad. x. 58–61 (1874), published the results of his first study of the eritrichioid borages of western United States. Following De Candolle he referred all the species of *Cryptantha* to *Eritrichium*, and cited as synonyms of the latter *Plagiobothrys*, *Krynitzkia* and *Piptocalyx*. Gray's presentation of the group in the Synoptical Flora, ii. pt. 1, 193–197, in 1878 is essentially that of his paper in 1874.

In the year 1876 Bentham & Hooker published that part of their Genera Plantarum, ii. 850–851, treating the *Boraginaceae*. These authors, accepting the work of De Candolle and Gray, added still more diverse elements to the already overburdened genus *Eritrichium*. The species of *Cryptantha* were placed under that genus and considered generically indistinguishable from plants now classified under *Oreocarya*, *Plagiobothrys*, *Amblynotus*, *Megastoma*, *Anoplocaryum*, *Trigonotis* and *Eritrichium*.

The genus *Eritrichium* thus became so unwieldy and so obviously heterogeneous that its break-up was inevitable. The reaction began with Gray's notable paper in 1885, Proc. Am. Acad. xx. 257–286, in which the species of *Cryptantha* and *Piptocalyx* were placed under *Krynitzkia* along with species now referred to *Amblynotus*, *Oreocarya*, *Antiphytum* and *Plagiobothrys* § *Allocarya*. This treatment was repeated in the supplement of the second edition of the Synoptical Flora, ii. pt. 1, 423–430 (1886), published shortly before his death in 1888.

In a series of three papers published in 1887 by Greene, Pittonia i. 8–23, 55–60 and 107–120, the American representatives of De Candolle's overburdened *Eritrichium* were segregated in detail. First the

genus *Allocarya* was formed to cover the species Gray had treated as *Krynitzkia* § *Myosotidea*. Then *Piptocalyx* was resurrected, and two new genera, *Eremocarya* and *Oreocarya*, were founded, the first based upon the plant of southwestern United States described as *Eritrichium micranthum* by Torrey in 1859, and the second upon *Eritrichium* § *Pseudokrynitzkia* and part of *Krynitzkia* § *Pterygium* described by Gray in 1885. *Amblynotus* and *Antiphytum*, although not mentioned, were apparently also considered distinct from *Krynitzkia*. *Krynitzkia* having been finally trimmed to evident homogeneity, Greene, commenting cynically on Gray's reasons for accepting *Krynitzkia*, discarded the name and took up the earlier *Cryptantha*.

In 1899 *Piptocalyx* Torr. having been found to be a homonym of the valid name of an Australian monimiaceous shrub published in 1870, the substitute generic name *Greenecharis* was published by Gürke & Harms. In 1906 Grant, Bull. So. Calif. Acad. Sci. v. 28, proposed the name *Wheelerella* as a substitute for *Greenecharis*, since the latter name was said to have not met with Greene's approval. In 1923 both *Eremocarya* and *Piptocalyx* were reduced to *Cryptantha* by Johnston, Contr. Gray Herb. n. s. lxviii. 55–57.

The genus *Johnstonella* Brand, Fedde Repert. 1925 (as learned from proof sheets) is based upon *Eritrichium racemosum*, a Californian plant described by Watson in 1882.

In the present paper *Cryptantha* is taken as including *Krynitzkia*, *Piptocalyx*, *Eremocarya* and *Johnstonella*.

Gross Morphology.

Roots. All the North American species of *Cryptantha* are clearly annual. In most of the species the root is a slender herbaceous taproot obviously of short duration. In *C. racemosa* and *C. holoptera*, however, the taproot frequently becomes lignified to such a degree that the species have been repeatedly described as perennial. Nevertheless field observation has shown that these species are also annual. Professor E. C. Jeffrey has obligingly sectioned and examined material showing the maximum wood-development in *C. racemosa*. No growth-rings were discernable in a woody root about 9 mm. thick or in a section of stem nearly 5 mm. thick. Since the species grows in a desert area which is subjected to a sharply defined rainy and dry season it is more than probable that the plant is indeed annual, since even in such circumstances it lacks annual-rings though these are produced in such associated desert shrubs as *Ephedra*, etc.

A purple dye is secreted in the roots of some species, particularly so in *C. micrantha*. According to Norton, Rep. Mo. Bot. Gard. ix. 149 (1898), this is alkannin, a dye secreted by species belonging to various genera of the *Boraginaceae*. The presence of conspicuous amounts of alkannin in the roots of *C. micrantha* has been stressed as one reason for giving that species generic recognition (as *Eremocarya*). However, very noticeable amounts of alkannin are frequently produced in the roots of *C. Fendleri*, *C. Grayi*, *C. muricata*, *C. maritima*, etc., although this fact seems to have been generally overlooked. In most species there is scarcely any evidence of the production of this dye.

Stems. The stems are usually slender and herbaceous, not infrequently somewhat fistulose. In *C. racemosa* the basal portion of the stem frequently becomes decidedly woody and almost 8 mm. thick. In this species, as well as in a number of others, the bark is frequently exfoliated in age. The common form of branching in the species of this genus is sparse, loose and ascending. Frequently, however, the branching becomes diffuse. Occasionally it is widely spreading, the branches becoming even subprostrate. Although the very lowermost branches are not uncommonly opposite, the middle and upper ones are more or less dichotomous. The dichotomy in *Cryptantha* varies much in the definiteness to which it is developed, although present in some degree in all the species. Strange to say, dichotomy has been considered a characteristic of *C. circumscissa* and *C. micrantha* and as characters of the segregate genera, *Greenocharis* and *Eremocarya*. The dichotomy of these species differs from that of indubitable members of *Cryptantha* neither in degree nor in nature. The ascendingly branched habit, rather characteristic of the genus, is absent in the common forms of *C. Fendleri* and *C. foliosa*, in which the stem is stiffly erect and forms a conspicuous axis.

Leaves. The leaves are narrow and elongate, becoming linear, lanceolate or oblanceolate, and having acute to obtuse or very rarely retuse apices. Though commonly sessile the lowermost leaves are sometimes more or less narrowed into a petiole. The texture of the foliage is usually firm. The several basal pairs of leaves are unmistakably opposite with more or less short, sheathing, connate bases. Opposite lower leaves are produced by all the North American species of the genus, being obvious in the seedlings, although tending to be obscure in the mature plants. Despite this fact, *Cryptantha* has been repeatedly described as having consistently alternate leaves. Opposite leaves frequently persist in fruiting plants of *C. affinis*, *C. ros-*

tellata, etc. In some species, such as *C. maritima* and *C. circumscissa*, the leaves, especially the basal portion, become tessellated through the silicification of the epidermal cells. Usually, however, the leaves are at most somewhat abundantly pustulate.

Trichomes. The trichomes of *Cryptantha* are all simple, unicellular, and more or less siliceous. They differ in no striking way from the type of appendages occuring in most genera of the *Boraginaceae*, cf. Solereder, Syst. Anat. Dicot. ed. 2, i. 555–560 (1908). The siliceous hairs are either smooth and somewhat transparent, or are more or less roughened by encrustations and somewhat opaque. They are clear or more or less tawny in most species, but in *C. flaccida*, *C. simulans*, etc., they are noticeably pallid. Commonly the hairs are straight, but decidedly falcate and uncinate ones are developed on the calyx-lobes of *C. flaccida* and allies. The bristles vary notably in direction, length and rigidity, the common form being a stiff, long, slender one. Since this type of pubescence varies much in stiffness, two degrees of rigidity are distinguished under the names, "hispid" and "hirsute." The very stiff, somewhat pungent extreme, exemplified by the conspicuous hairs produced by typical *C. intermedia*, is termed "hirsute." The less rigid, more slender pubescence developed on the stems of such species as *C. Hendersoni* is termed "hispid." The trichomes are commonly spreading or somewhat appressed. Not infrequently, however, in such species as *C. flaccida*, *C. Clevelandi*, *C. dumetorum*, etc., the hairs are short and very closely strigose. More or less stiffish villous hairs are frequently developed, particularly on the calyx-lobes. This is best shown in *C. crinita* and *C. maritima*, var. *pilosa*. Subvillous hairs are occasionally found on the stems of some species, notably *C. pterocarya*. The bristles on the calyx-lobes are frequently quite stout. Probably the most decided extreme of this development is to be found in *C. foliosa*.

Associated with the bristle-like trichomes on the stem and leaves are the pale blistery structures called pustules. These are composed of a circle of slightly elevated, silicified, opaque, tessellately arranged epidermal cells surrounding the base of the trichome. They show much variety in size and frequency, varying from total absence to decided abundance, and up to a diameter of 1–3 mm. Similar structures are known in many European borage genera, cf. Revedin, N. Giorn. Bot. Ital. ser. 2, ix. 301–318 (1902). According to Solereder, l. c., the pustulate trichome-bases are cystolith-like in origin.

Inflorescence. The flowers of *Cryptantha* are borne in two ranks in unilateral cymosely arranged spikes or racemes. Although funda-

mentally the spikes or racemes are disposed in a rhipidial cyme, this fact is often obscured by the complete reduction of the internodes within the inflorescence and consequent crowding of the spikes or racemes into fascicles terminating the branches. In species such as *C. micrantha, C. circumscissa, C. albida, C. Grayi, C. micromeres,* etc, the spikes are not at all fascicled, the cymose forking appearing to be indefinitely repeated and ending only at the death of the plant. With other species, of which *C. affinis, C. ambigua, C. echinella, C. mariposae, C. patula,* etc., are examples, the cymose forking is repeated only a very few times, perhaps only once. In all these cases the spikes or racemes are solitary or geminate, and not grouped into fascicles. The cymosely forking stem is terminated at any one time by a pair of spikes or racemes, and bears down its sides the solitary spikes which earlier were terminal. In such species as *C. muricata, C. flaccida, C. intermedia,* etc., by a complete suppression of the internodes separating the spikes, 3–6 of these have been crowded together to form a terminal fascicle. In *C. micrantha* scattered internodes are suppressed, this being shown by the opposite or subopposite bracts sprinkled through the inflorescence.

The racemes or spikes are loosely or somewhat densely flowered in age, but in *C. glomeriflora, C. leiocarpa, C. Torreyana* and *C. simulans* the flowers are frequently glomerate-congested. Most of the species have the spikes or racemes bractless or at most with 1 or 2 bracts occasionally subtending the lowermost flowers. In *C. albida, C. maritima, C. minima, C. micrantha, C. circumscissa,* etc., the spikes are leafy-bracted throughout or nearly so. Some forms exemplified by *C. ambigua, C. mariposae, C. crassisepala,* etc., have the peduncles of the spikes or racemes leafy, whereas others, such as *C. intermedia, C. pterocarya, C. microstachys,* etc., have even these naked. The rhachis of the spike is terete in all species except *C. dumetorum,* in which it is decidedly compressed and rather fragile.

Corolla. The corolla is white, and subtubular or more commonly short rotate-salverform. It may be very minute and inconspicuous, or become conspicuous and as much as 7 mm. broad. The tube always about equals the calyx-lobes and bears below the middle 5 stamens, the filaments of which about equal the length of the short-oblong included anthers. The throat is poorly developed, producing at the base 5 small intruded hemispherical or subtrapeziform appendages that occasionally almost close it. The lobes are variously developed, being either ovate-oblong or suborbicular, and either widely spreading or more or less strictly ascending. In the North American

species there are no cleistogamous flowers such as those developed in several groups of Chilean species.

Calyx. The calyx is usually much accrescent in fruit, *C. micromeres* being the species in which this is least so. Since the accrescent fruiting calyx is the most modified, in addition to being the most conspicuous, it alone is considered. Commonly it is divided to near the base, although in species such as *C. pusilla*, *C. sparsiflora* and *C. glomeriflora* it is less deeply so. In *C. circumscissa*, however, the calyx is obviously united to near the middle and in addition is unique in the genus in being circumscissile just below the sinuses. The fruiting calyx commonly shows more or less evident tendency towards irregularity or asymmetry. The mature calyces of such species as *C. albida*, *C. oxygona*, *C. pterocarya*, *C. holoptera*, *C. pusilla*, *C. micrantha*, etc., are regular or subregular. On the other hand the fruiting calyces of *C. dumetorum*, *C. flaccida*, *C. recurvata*, *C. echinosepala*, etc., are obviously asymmetrical. Commonly the irregularity is manifest in the slightly greater length and more conspicuous pubescence of the abaxial calyx-lobe. Less commonly, however, as in *C. recurvata* and *C. echinosepala*, it is the axial calyx-lobe that is the longest and most hispid or hirsute. Because it commonly very closely invests the nutlets, the mature calyx frequently becomes somewhat asymmetrical in consequence of the irregularities in shape or abortion of the nutlets. *Cryptantha dumetorum* has the calyx axially and downwardly gibbous, *C. affinis* has it compressed, *C. recurvata* has it obviously curved, and such species as *C. utahensis* or *C. flaccida* have it oblique or distorted. The base of the mature calyx may be rounded, conical or more or less angulate, and may be regular or oblique or evidently asymmetrical. In texture it is usually somewhat firmly herbaceous with the epidermis tending to become silicified. The calyces of *C. circumscissa* exhibit the extreme of this tendency towards silicification. The lobes of the mature calyces vary from narrowly ovate through lanceolate to linear. Though occasionally erect, they are commonly somewhat connivent above and have their tips spreading or even recurved. In pubescence the fruiting calyx shows various tendencies. The midrib, which is weakly developed in such species as *C. pterocarya*, *C. pusilla*, *C. circumscissa*, etc., and very strongly so in *C. crassisepala*, *C. intermedia*, etc., is commonly armed with evident bristles which vary in length, direction, slenderness and rigidity. The fructiferous calyx is usually ascending, but may be strictly and closely appressed to the rhachis as in *C. dumetorum*, *C. flaccida*, *C. microstachys*, etc., or spreading or deflexed as in *C. recurvata* or *C. echinosepala*.

The pedicel of the completely developed calyx is commonly very short or almost undeveloped. Although pedicels are lacking or practically absent in most species, evident and well developed ones are produced by *C. racemosa*, *C. holoptera* and *C. crinita*. Since the pedicels are clearly developed only in these three species they alone, in the present monograph, as treated as having "racemes." The remaining species, which have sessile calyces or very obscure pedicels, have been uniformly accredited with "spikes" although the unit of the inflorescence in some of the species might be more exactly described as "spicate-racemose" or "racemose-spicate." The preponderance of species have deciduous calyces. As already mentioned *C. circumscissa* has a circumscissile calyx. In this the lower cup-like portion is firmly attached and clearly persistent. Persistent calyces also occur in *C. micrantha* and *C. dumetorum*, and subpersistent ones are produced by *C. albida* and *C. racemosa*.

Fruit.[1] The fruit of *Cryptantha* consists of 4 or fewer, elongate, ventrally grooved nutlets affixed to a usually elongate central gynobase. Most of the species have 4 ovules, but in *C. recurvata* and *C. maritima* only 2 are normally present. *Cryptantha maritima*, however, has an insular variety that is distinguished only by having 4 rather than 2 ovules. In shape the nutlets vary from broadly ovate or triangular-ovate to narrowly lanceolate. The back may be somewhat flattened, but is commonly more or less convex, although in *C. muricata* it is obtusish with a suggestion of a medial dorsal ridge. The sides of the nutlets in most species are clearly rounded or somewhat obtusely angled, but they may be quite acutely angled as in *C. mohavensis*, *C. angustifolia*, etc. In species like *C. utahensis*, *C. costata*, *C. racemosa*, etc., the margin is drawn out into a very narrow, thin, knife-like border. In other species the margin is greatly developed, wing-like, and about the width of the body of the nutlet. *Cryptantha holoptera* and *C. pterocarya* produce nutlets of this sort. In *C. pusilla* and frequently in *C. muricata*, the edges of the nutlets are thickened to form a bead-like margin. The surface of the nutlet may be smooth and shiny as in *C. Torreyana*, *C. leiocarpa*, *C. Fendleri*, etc., or may be variously roughened. In species such as *C. ambigua*, *C. simulans* and *C. Hendersoni* the roughenings consist of small, low, rounded bosses, a condition here described as tuberculate. Other species may have the nutlets studded with conical warts and thus become muricate, or with rather elongate nipple-like warts rendering

[1] The nutlets as well as all other minute structures have been consistently studied through a binocular dissecting microscope magnifying 38 diameters.

the surface papillate. Other species such as *C. muricata, C. intermedia, C. barbigera,* etc., have the surface of the nutlets verrucose, i. e. sprinkled with coarse simple warts. Species such as *C. crassisepala, C. echinella* and forms of *C. Hendersoni* have the nutlets covered with spinular papillae. On the roughened as well as the smooth nutlets the surface is frequently more or less covered with minute, white discules. Such nutlets have been traditionally but not very precisely described as granulate.

Although 4 ovules are commonly produced, one or more of them may fail to mature. Some species, it is true, characteristically mature 4 nutlets, but even in these one or more may be aborted. This abortion may prevail throughout the plant or be restricted largely to either its younger or older parts. This suggests that abortions may be partially connected with the nutrition of the plant as influenced by seasonal conditions. In other species, such as *C. flaccida, C. microstachys, C. texana,* etc., only a single nutlet is matured under normal conditions. This is either the axial or the abaxial one, its position being commonly characteristic of the species. In still other species, such as *C. Clevelandi* or *C. hispidissima,* the number of nutlets developed does not seem to be constant, 1–4 being matured, although, according to the species, the axial or abaxial nutlet is always developed. This tendency to individualize a particular one of the 4 nutlets seems to be more or less evident in all the species. It has been carried out in a conspicuous extreme in *C. crassisepala, C. maritima, C. dumetorum, C. micromeres,* etc., in which one nutlet is more firmly attached, larger than the others and often differently colored or roughened. In some species with homomorphous nutlets, such as *C. albida,* this tendency is revealed only by the greater persistence of some particular nutlet. A few species do not seem to show the tendency described. In *C. mohavensis* and *C. Watsoni* they seem to be almost perfectly homomorphous. In the specific group containing *C. ambigua* there appears to be no prevailing tendency towards individualizing a particular nutlet. In this respect the specific group is unique. The natural classification offered in this monograph is largely formed of groupings of species agreeing in the position (axial or abaxial) of the individualized or odd nutlet. Strange to say, it has been the current impression that heteromorphous nutlets were restricted to the specific group containing *C. crassisepala,* although, in fact, the condition is well developed in another specific groups, and, as already stated, its presence in the *C. crassisepala*-group is notable only because it has there an extreme expression.

The ventral groove of the nutlet may be open or closed (not fused) and may be simple or forked below. Some species, such as *C. Torreyana*, have the groove almost invariably closed, others, such as *C. Fendleri*, have it characteristically open, while still other species, such as *C. intermedia*, may have it open or closed. In *C. albida* the groove is very broadly dilated and becomes excavated. A similar condition is present in the consimilar nutlets of *C. crassisepala* and *C. minima*. The groove of *C. costata* is open, but is extremely shallow. In *C. flaccida* the groove is not only closed, but frequently has one margin overlapping the other. The groove of *C. leiocarpa* is closed and not forked or is very obscurely so at the very base. In *C. ambigua*, *C. Torreyana*, etc., it is very broadly forked below. In most species there is a small open areola formed at the forking. The groove on the more or less asymmetrical nutlets of *C. affinis* and *C. glomeriflora* is evidently excentric and dilated below into an irregular triangular areola.

The gynobase varies from quadrangular-subulate to narrowly pyramidal or very shortly columnar. Usually it is subulate as in *C. intermedia*, *C. leiocarpa*, *C. Fendleri*, *C. pterocarya*, etc. The narrowly pyramidal form is produced by *C. albida*, *C. pusilla*, etc. In species such as *C. texana*, *C. glomeriflora*, *C. microstachys*, the gynobase is reduced to an inconspicuous, exceptionally short column. It commonly reaches to about $\frac{2}{3}$ the height of the nutlets, though frequently in such species as *C. Grayi*, *C. costata*, *C. holoptera*, etc., it reaches to the summit of the nutlets, or in species such as *C. glomeriflora* and *C. microstachys* only to about $\frac{1}{4}$ the height of the latter. Commonly the style is sharply differentiated from the gynobase. In *C. micrantha*, however, the style is not clearly set off and appears to be the subulate prolongation of the gynobase. In the length of the style and the height to which it reaches on the nutlets, the species noticeably vary. Generally the style reaches to $^{2}/_{3}$–$^{4}/_{5}$ the height of the nutlets, but it may just reach the tips of the nutlets or even surpass them. In species such as *C. glomeriflora* and *C. flaccida* the style reaches less than $^{1}/_{3}$ the height of the nutlets.

ABNORMALITIES. In Southern California and less commonly in the deserts of Nevada and Utah, the plants of *Cryptantha* frequently become fasciated. All or only some of the stems are affected. The abnormal stems are short and for the most part unevenly reddish-tinged, and are clothed with strictly ascending, scarcely reduced leaves. The spikes are usually undeveloped, or are partially developed and form a glomerate infertile mass above. The affected plant as a

whole is very dense and broom-like. Although clearly abnormal the cause of this condition has not been ascertained. *Cryptantha* has been reported as host for *Puccinia ryptanthes* Diet. & Holw., *P. submitens* Diet. and *Synchitrium myosotidis* Kühn., but none of these fungi causes such abnormal growth. A microscopic examination has failed to disclose any other fungi affecting the plant, nor any mites, aphids or similar parasites capable of profoundly disturbing it. The condition described has been noted in *C. intermedia, C. barbigera, C. simulans, C. angustifolia, C. gracilis*, and *C. pterocarya*, although it appears to be most common in the species first mentioned.

Systematic Position of the Tribe Eritrichieae.

Cryptantha is obviously a member of the *Eritrichieae* and appears to have been derived from the closely related, and also West American genus, *Oreocarya*. It is believed that this genus was evolved from the *Lithospermeae* through some forms similar to the North American species of *Antiphytum*. These opinions assume the correctness of the arrangement of the tribes of the *Boraginaceae* given in a recent paper by Johnston, Contr. Gray Herb. n. s. lxxiii. 42 (1924). Since the assumption there expressed, that the *Cynoglosseae* are derived from the *Lithospermeae*, is directly contrary to that accepted in standard works, it seems well to state the reasons for this belief so that the direction of evolution may be understood and phylogenetic speculations regarding *Cryptantha* logically founded.

Brand, Pflanzenr. iv. Fam. 252, pt. 1, 14 (1921), agreeing with previous authors, considers the *Cynoglosseae* among the *Boraginoideae* to be most nearly related to the *Heliotropioideae*, saying "Der endständige Griffel, das Charakteristikum der *Cordioideae, Ehretioideae* und *Heliotropioideae* findet sich bei den *Borraginoideae* in 2 Gattungen, *Trichodesma* und *Lacaitaea*, wenigstens zur Blütezeit. Diese beiden Gattungen müssen daher an der Spitze der *Cynoglosseae* stehen, ..." However, *Trichodesma* and *Lacaitaea* clearly have pyramidal gynobases, their appendaged nutlets are attached supramedially and have free bases. These developments represent considerable departure from the *Heliotropioideae* and very much greater departure than the common developments produced by the *Lithospermeae*. This may be appreciated after consideration of the following data.

The *Boraginaceae* appear to have sprung from ancestors with two, (at least) biovulate carpels. This is suggested by the occurrence in many of the shrubby genera of the *Heliotropioideae* and *Ehretioideae*

of fruit which is 2-celled, is more or less incompletely 4-celled, or has decidedly paired carpels, cf. Miers, Contr. Bot. ii. 190–261 (1869), and further suggested by stages in the development of the fruit in various members of the family, cf. Baill. Adansonia iii. 1–7, t. 1 (1862); Rosanoff, Jahrb. Wiss. Bot. v. 72–80, t. 5–6 (1866) and Payer, Organ. Vég. 546–549, t. 112 (1857). At an early stage in the development medial partitions form which divide each of the two carpels so that at maturity the fruit becomes virtually 4-carpellate.

The primitive fruit was probably similar to that of the *Hydrophyllaceae*, being 2- or imperfectly 4-celled, capsular, and terminated by a lobed style. The lobed style consistently occurs in those tribes of the *Boraginaceae* which are commonly considered primitive, i. e. the *Heliotropioideae*, *Ehretioideae* and *Cordioideae*. Within the *Boraginoideae* the style is lobed or bears geminate stigmas only in the *Lithospermeae*. Within in the subfamily it is borne on a flat receptacle or more commonly on an elevated gynobase. In the more primitive subfamilies the style is seated in the pericarp, usually at the tip of the more or less globular, 2–4-celled fruit. There is no thickened, persistent gynobasic column connecting the style directly with the receptacle, the style being seated in pericarpial tissue and falling away with some one of the carpels when the fruit breaks up. This condition prevails in the *Heliotropioideae* and *Ehretioideae*, and is completely and fundamentally different from that in the *Cynoglosseae* and in *Trichodesma* or *Lacaitaea* in particular.

The nutlets have resulted from a pinching in of the pericarpial walls to form lobes of the fruit each containing one carpel. The stages of this development may be appreciated by a comparative study of the fruit of *Heliotropium* or, better still, *Coldenia*. *Coldenia canescens*, T. & G. Pacif. R. R. Rep. ii. pt. 2, 169, t. 7 (1856), has an unlobed fruit bearing a decidedly terminal style. *Coldenia Nuttallii*, Torr. Bot. Wilkes Exped. 410, t. 12 (1874), or *C. hirsutissima*, T. & G. l. c. 170, t. 9, has the lobing evident and the style attached to the pericarp between and below the apices of the nutlets. In *C. litoralis* the lobing is almost complete and the style is affixed practically upon the receptacle. From a study of this, and similar series, it seems clear that the development of the nutlets has proceeded by the deepening downward from the apex, and inward from the sides, of the pinching in of the pericarp between the carpels. This finally results in an obviously basal attachment of the nutlets, and the gradual lowering of the style-base between the nutlets until it is at last directly and firmly affixed upon the receptacle. The gynobase appears to be sub-

sequently developed, either by the thickening of the style-base, or by the pushing up of the central portion of the receptacle.

It seems clear that the *Cynoglosseae* are not the primitive members of the subfamily *Boraginoideae*, for the nutlets are not attached basally, but apically or subapically, and, except in such anomalous genera as *Harpagonella*, *Antiotrema* and *Bothriospermum* in which the nutlets are completely inverted and attached by the (morphological) tip to a flattened gynobase, the gynobase is obviously developed. A study of the stages in the history of nutlet-development in the *Heliotropioideae* and *Ehretioideae* is conclusive in showing that the base of the fruit-lobe, in these unspecialized groups, is never free when the apex is not, although the contrary condition is of common occurrence. The nutlets being basally attached and the gynobase commonly flat in the *Lithospermeae* it seems quite obvious that the group is indeed the most primitive one of the *Boraginoideae* and hence closest to the *Heliotropioideae*. Significant in this regard, is the fact that the heliotropioid stigma is suggested in certain species of *Lithospermum*. The stigma in this genus occasionally becomes somewhat lateral with the style-branches prolonged beyond them. Rarely the lobes become more or less fused and the stigmas, brought near one another, tend to cohere just as illustrated by Reichenbach, Icon. Fl. Germ. xviii. t. 113 (1858). The result is a stigma differing in no profound way from that characteristic of the *Heliotropioideae*. The primitive subfamilies being prevailingly woody it is also significant that within the *Boraginoideae* the most decided tendency towards woodiness is found in the *Lithospermeae*.

Not only do the *Cynoglosseae* lack certain features suggesting close relationship in the *Heliotropioideae*, but they have developments which make such an affinity seem improbable. As previously mentioned, the style is gynobasic and though appearing to be terminal in *Trichodesma* is not really so. A careful examination of *Trichodesma* shows clearly that the style is not attached at the apex of the fruit and seated in pericarpial tissue, as in *Heliotropium* for example, but is definitely borne at the apex of a well developed gynobase. The nutlets are covered with highly specialized appendages which suggest nothing in the *Heliotropioideae* or *Ehretioideae*, although the development of these appendages can be traced back into the immediately related tribe *Eritrichieae*, from which the *Cynoglosseae* seem in fact to have evolved. The apical nutlet-attachment of the *Cynoglosseae* is wholly unlike any development in the less specialized subfamilies, but is obviously the termination of a strong tendency towards

elevation of the nutlet-attachment which is discernable in the *Lithospermeae* and quite evident in the *Eritrichieae*.

The *Lithospermeae* being thus considered the most primitive tribe of the *Boraginoideae* because of its basifixed unappendaged nutlets, non-gynobasic usually lobed style or double stigmas, unspecialized corollas, and frequent development of woody habit, it now becomes a relatively simple matter to place the tribe *Eritrichieae*. The *Lithospermeae* appear to have evolved from some primitive member of the *Heliotropioideae* or specialized member of the *Ehretioideae*. The tribe appears to have given rise to two principal evolutionary lines. On one hand to the relatively unimportant line represented by the *Anchuseae*, in which the nutlet-attachment has tended to become conspicuously margined and the attachment-surface on the nutlet tended to become elevated into a strophiolate plug. On the other hand it has evolved into a major line of development which ends in the *Cynoglosseae*, the most specialized group in the entire family. This latter evolutionary line is characterized by a tendency of the nutlet-attachment to move from the chalaza-end of the nutlet towards the radicle-end, i. e. from base to apex, and for the nutlets to vary from rounded and smoothish towards margined and variously roughened and appendaged. The *Eritrichieae* form a rather arbitrary group including the medium developments on the latter line. The tribe is usually regarded as including the genera in which the nutlet-attachment is typically lateral. The nutlets may be smooth or roughened or appendaged, margined or unmargined. The other characters indicative of the *Eritrichieae* have been already outlined in another paper, Contr. Gray Herb. n. s. lxxiii. 57 (1924), and need not be repeated here.

Generic Relations.

As previously stated, *Cryptantha* is obviously a member of the tribe *Eritrichieae* and is apparently derived from the very closely related genus *Oreocarya*. Among their immediate relatives, *Oreocarya* and *Cryptantha* are together characterized by the possession of a medial ventral groove on the nutlets, this formed by the non-fusion of the pericarpial walls. This development appears to have been brought about by the gradual encroachment of the pericarp over the surface of a sharply cut triangular attachment-scar such as those present in the *Lithospermeae*. This encroachment gradually narrows the attachment-surface of the nutlet and forms a groove which is usually somewhat forked at the base. In *Cryptantha* and *Oreocarya* the groove

is narrow, but not completely closed. In *Amsinckia*, *Plagiobothrys*, etc., the forked groove is entirely shut and its location is marked by a ridge of fused, pericarpial tissue which bears the caruncular scar, or small modified areola at the forking below the middle of the nutlet.

It seems quite likely that *Oreocarya* has been derived from some form of *Antiphytum*, a genus of the *Lithospermeae* evidently derived from *Lithospermum*. Such a species as *A. peninsulare* not only has a habit suggestive of *Oreocarya* and related genera, but has nutlets, which, except in the nature of the attachment, are remarkably like those of some species of *Oreocarya* and *Plagiobothrys*. Its rather large attachment surface is lateral and submedial, but is otherwise like the attachment-surface of most *Lithospermeae*. The encroachment of the pericarp over the scar of *A. peninsulare* would result in a nutlet remarkably like that of *Oreocarya* or *Plagiobothrys;* the particular similarity depending on the extent to which the encroachment proceeded. It is to be noted, however, that *Antiphytum* has a style bearing geminate stigmas, whereas *Oreocarya*, *Plagiobothrys*, *Cryptantha*, etc., all have solitary stigmas. Inasmuch as the stigmas of *Antiphytum* are less obvious than are those of *Lithospermum*, its progenitor, it is not hard to suppose that this tendency was carried to an extreme and the geminate stigmas became coalescent in the progenitor of *Oreocarya*.

Cryptantha is a specialized off-shoot from *Oreocarya*. The latter genus consists of rather coarse perennials, or rarely biennials, with persistent fructiferous calyces and homomorphous nutlets. In *Cryptantha* a successful, annual, herbaceous habit has been evolved, in addition to more or less deciduous fruiting calyces and somewhat heteromorphous nutlets. By taking on the annual habit, and developing detachable somewhat bur-like fruiting calyces, *Cryptantha* has been able to reproduce, spread and evolve very rapidly, adapting itself to the variety of conditions in western America and greatly surpassing *Oreocarya* both in number and in the variability of its species.

Oreocarya seems to have also given rise to *Plagiobothrys*, a group which seems to have evolved into *Amsinckia*, and into a line producing *Microula*, *Craniospermum*, etc. The principal derivative of *Oreocarya*, however, appears to be *Hackelia*, for through that genus *Oreocarya* appears to connect with *Cynoglossum* and the tribe *Cynoglosseae*.

While the medial ventral groove on the nutlets of *Oreocarya* and *Cryptantha* characterize these genera among their immediate relatives, the development is by no means peculiar to them. It is present in *Microcaryum*, *Amblynotus* and *Megastoma*, and slightly developed in *Oreogenia* and *Chionocharis*. *Microcaryum*, *Oreogenia* and *Chiono-*

charis appear to be Asiatic developments from the plexus containing *Plagiobothrys*. The immediate relations of *Amblynotus* are wholly obscure. *Megastoma*, although remarkably simulating *Cryptantha*, cf. Bonnet & Barratte, Ill. Phaner. Tunis t. 11 (1895), and having been accepted as a close relative of the genus by all authors including the writer, Contr. Gray Herb. n. s. lxxiii. 64 (1924), appears in fact to be of the *Lithospermeae* and to be most closely related to *Echiochilon*. The detailed study of specimens, recently at hand, shows the stigma to be decidedly geminate, and the yellowish unappendaged corollas to be slightly irregular and to bear the stamens at slightly unequal heights. *Megastoma* is immediately related to *Echiochilon*, agreeing with it in its irregular calyx and corolla, but differs from it in its broadly grooved nutlets, large gynobase, glabrous and much less irregular corolla and almost equally inserted stamens. *Echiochilon* is practically an African genus, and the affinities just mentioned with *Megastoma*, a plant of the deserts of Algeria and Tunis, seem thoroughly satisfactory on phytogeographical grounds, and vastly more so than the supposed relations between *Megastoma* and *Cryptantha*.

Generic Concept.

As here taken the genus *Cryptantha* includes *Krynitzkia*, *Piptocalyx*, *Eremocarya* and *Johnstonella*. Since two of these genera have achieved some currency in botanical literature it seems well to review the claims which these rejected genera have for recognition.

Since the resurrection of *Cryptantha* by Greene in 1887, *Krynitzkia* has been almost universally regarded as a clear synonym of the earlier genus. *Krynitzkia*, in fact, appears to have been deliberately maintained only by Katherine Brandegee and Prof. M. E. Jones. Mrs. Brandegee, I have been told, was not satisfied that the cleistogamous Chilean species, i. e. the true species of *Cryptantha*, were actually congeneric with the more abundant open-flowered species which form the bulk of the genus in South America and the entire representation of it in North America. Being in doubt as to the applicability of the earlier name, *Cryptantha*, she was content to follow Gray in accepting the name *Krynitzkia*, since there could be no uncertainty regarding the applicability of it to the North American plants. Similar reasons, as well as his confidence in Gray's judgment, seem to have given Jones the basis for his persistent use of *Krynitzkia* in the broad interpretation of Gray.

The two original species of *Cryptantha* and several other closely

related ones depart from the common phases of the genus in no striking development other than the presence in the inflorescence of more or less numerous cleistogamous flowers. As these commonly occur variously mixed with open flowers, and since they are borne on plants which in gross habit and inflorescence, as well as in details of fruit and calyx, are quite like the completely normal-flowered plants, there seems to be no reason why we should differ from Reiche, Fl. Chile v. 217–237 (1910), who has studied the Chilean species, and consider the name *Cryptantha* applicable only to the few Chilean species bearing cleistogamous flowers in the inflorescence. Especially is this the case when it is remembered that another and more peculiar phase of cleistogamy, in such species as *C. phacoloides* and *C. linearis*, goes completely unrecognized.

Of the four genera reduced under *Cryptantha*, *Piptocalyx* is the most notable. Under the name *Piptocalyx* or *Greeneocharis* this portion of the genus has gained rather wide generic recognition following its reinstatement by Greene in 1884. Previously, however, it had been usually treated as a section under *Eritrichium* and later under *Krynitzkia*. In 1921 Johnston gave it sectional rank under *Cryptantha*. The outstanding development of *Piptocalyx* is its persistent circumscissile calyx. In flowers, fruiting structures, as well as inflorescence and branching, it differs in no fundamental way from the *Cryptantha* species related to *C. angustifolia*. In fact, its gross habit is such that it was once described as a species of *Cryptantha* by A. Nelson. Greene, in resurrecting the genus, made much of the dichotomy of *Piptocalyx*, although the cymose branching is decidedly similar, if not exactly the same as that developed in *C. Grayi*, *C. angustifolia*, etc. Rather than showing a profound difference, like the fruiting structures, the cymose branching suggests a very close affinity between *Piptocalyx* and *C. micrantha*, *C. Grayi* and *C. angustifolia*. The character of branching failing to separate *Cryptantha* and *Piptocalyx* the latter must, perforce, stand or fall according to the emphasis placed on its peculiar calycine developments. It is to be noted that the possible generic characters of *Piptocalyx*, the circumscissile fission of the calyx and the persistence of the cupulate calyx-base, merely represent phases of a single aberrant structure. For this reason it has been considered unwise to separate the plant from its obviously close affinities in *Cryptantha*. Furthermore, species with circumscissile calyces and those without are universally admitted to the closely related genus *Plagiobothrys*, and in addition the degree to which the calyces are persistent in *Cryptantha* is variable, they being

readily deciduous, or persistent or subpersistent as in *C. albida, C. racemosa, C. dumetorum, C. micrantha*, etc.

Eremocarya, like *Piptocalyx*, has achieved wide recognition since its publication in 1887. Unfortunately it appears to lack characters of generic value. Greene, who launched the genus, laid much emphasis upon its spikes, which were described by him as "biserial and very dense, conspicuously leafy-bracted, and repeatedly forked." Except for the bracts and the complete lack of reduced internodes, the inflorescence and branching of *C. angustifolia* and *C. Grayi* are exactly similar to those of *Eremocarya*. More or less similar biserial, leafy-bracted and repeatedly forked cymes are to be found in such species as *C. circumscissa, C. albida, C. maritima*, etc. It can be decisively said that *Eremocarya* can not be separated from *Cryptantha* by any character of inflorescence.

The calyx of *Eremocarya* is said to differ from that of *Cryptantha* in its persistence. However, calyces as persistent as those of *Eremocarya* occur in *C. dumetorum*, a species no one has attempted to exclude from *Cryptantha*. The style in *Eremocarya* is scarcely distinguishable from the gynobase proper. This thickened style, appearing as a continuation of the gynobase, much surpasses the nutlets and bears the stigma almost at the level of the tips of the calyx-lobes. Similarly elongate and persistent styles are developed in *C. racemosa*. The thickness of the style, therefore, appears to be the only peculiar character of *Eremocarya*. This is not considered of generic value.

The genus *Johnstonella* is being proposed by Brand to include certain species thought to be generically ambiguous. *Cryptantha racemosa*, the type species, is said to have persistent calyces, thereby exhibiting a salient character of *Oreocarya*. In habit the plant is clearly a *Cryptantha*. It seems to be of particular note only because of its more or less suffrutescent character. In duration, however, it is unquestionably annual. Furthermore it can be definitely said to have deciduous calyces. There are at least twenty collections in the Gray Herbarium and University of California Herbarium which exhibit completely or partially denuded raceme-rhachises. The calyces are no more persistent than are those of *C. holoptera* or *C. albida*, and not so decidedly so as are those of *C. dumetorum*. The genus is clearly synonymous.

Expanding the limits of *Cryptantha* to include the four genera just discussed we dispose of several small or monotypic genera, and obtain a very naturally defined and readily recognized genus. This covers more or less stiffly haired, rather slender annual herbs which agree

in having more or less distinctly biserial spikes or racemes of white flowers and later somewhat irregular deeply lobed hairy calyces, and which develop 1–4 somewhat heteromorphous nutlets that are attached laterally to an erect gynobase through a medial ventral groove. As a group it inhabits sunny open places, in North America ranging from southern Alaska to southern Mexico, although it is most common in western United States, and particularly so in California. It is to be confused only with *Oreocarya* and *Plagiobothrys*. From the former, its closest relation, it differs in its slender annual, rather than coarse biennial or perennial habit, and commonly deciduous, rather than invariably persistent calyces. From *Plagiobothrys* (including *Allocarya* and *Somma*) it differs in having the nutlets attached through a ventral groove, rather than through a caruncular scar or along the crest of the ventral keel.

The Species.

Fifty-seven species, two of which are new, are here recognized as occurring in North America. This is approximately half the total number of species, the genus having a similar development in Chile, Argentina and Peru. In North America most of the species occur in California, forty-five being known from that state alone. The genus, however, is not infrequent over most of western United States. One species, *C. Torreyana*, ranges northward to southern Alaska and another, *C. albida*, occurs as far south as southern Mexico. The most easterly ranging species are *C. minima*, which reaches central Nebraska, and *C. texana*, which reaches east-central Texas. Most of the species grow in warm, open, gravelly or sandy places, particularly on the desert, others occur on dry, sunny, open flats in the pine-belt of the mountains and still others grow on open, grassy slopes or in clearings or burns in chaparral. The plants have no conspicuous place in the vegetational succession of the region, being secondary herbs commonly forming vernal or estival colonies in the earlier stages of the succession.

The describers of the oldest species made much of the shape and appendages of the corolla. With the increase of material the relative uniformity of the corolla-structures became apparent, and the attention, after having first been laid on the mere presence or absence of roughenings on the nutlets, was finally focused on the character of the nutlet-groove. Much of the confusion that has obscured the species of this genus is directly traceable to the persistent and ex-

cessive emphasis which has long been laid on this character. The groove of the nutlet shows much more intraspecific variation than has been realized. While decidedly valuable in recognizing certain species, it is after all a character of only secondary importance, and, like every other character in this genus, is subject to decided and frequently erratic variations. It is obvious that the character is only to be used in conjunction with others.

The most important specific characters are certain fruit-developments. Among the most valuable of these are the extent and nature of the individualization of the axial or abaxial nutlet, the number, size, shape and surface of the nutlets, the nature of the nutlet-groove, the shape and height of the gynobase, and the height reached (in relation to the nutlet-length) by the style. The size of the corolla is frequently significant, as is also the size, shape, direction and depth of lobing of the fruiting calyx, and the shape, direction and pubescence of the mature calyx-lobes. The arrangement of the spikes or racemes, as well as the presence or absence of bracts, is important. So also is the character of the pubescence.

The excessive variability of the characters of *Cryptantha* does not seem to have been fully appreciated. Particularly confusing in this genus is its propensity for unexpected, erratic variation in a single character or group of related characters. This is probably due to the fact that the species have a short life-cycle and are in active evolution. As a result the worker in this group is constantly confronted with much aberrant material. It is frequently necessary, therefore, to admit as atypical phases of a given species many specimens whose mass of characteristics indicate the accepted relation, even though the atypical character be a favorite one and perhaps that emphasized in the key. To attempt to name these atypical forms seems thoroughly unwise, since they are endless, and commonly represent odd plants or extremely localized phases, or, as seems likely, intraspecific hybrids.

Some of the species admitted completely intergrade. In most cases these species occupy adjacent floral districts, and the intergradation is confined to a definite region lying between them, being thus in all probability of hybrid origin. In any case it seems best to maintain certain intergrading groups as specific, since to insist upon absolute non-intergradation as a criterion of specific difference would result in extensive reductions and give a condition as unsatisfactory as would extensive segregation. The groups treated as species, however, can be readily recognized after a little study and appear to be eminently natural, having a characteristic gross aspect and credible ranges.

SYSTEMATIC ACCOUNT.

Generic Characters.

Cryptantha Lehm. Calyx lobed to below middle or more commonly almost to base, accrescent in fruit, usually deciduous; lobes linear to lanceolate or rarely lance-ovate, erect or connivent above in fruit, often slightly unequal; pedicels erect to widely spreading, commonly very poorly developed. Corolla white, minute to evident, regular, glabrous; tube cylindrical, equalling calyx-lobes or surpassed by them; throat saucer-shaped or somewhat funnel-form, more or less closed below with 5 semicircular or subtrapeziform intruded appendages; lobes 5, imbricate, orbicular to obovate-oblong, spreading or occasionally somewhat erect. Stamens 5, included; filaments short, equally inserted below the middle of the corolla-tube; anthers short-oblong, about as long as the filaments. Ovules 4 or rarely 2, amphitropous. Nutlets 1–4, straight, usually vertical, ovate to lanceolate, affixed laterally through an elongate medial ventral groove to a pyramidal or subulate erect gynobase, unmargined or with more or less well developed marginal wing, smooth or somewhat warted or spiculiferous, neither rugose nor keeled, usually deciduous, tending to be heteromorphous. Seeds ascending, vertical, chalaza-end lowermost. Cotyledons flat, broad, undivided. Style included in the corolla-tube at anthesis, surpassing the tips of the mature nutlets or greatly surpassed by them, bearing a distinctly solitary simple terminal stigma.—West American annual herbs with stiffish pubescence. Leaves linear to lanceolate or spatulate, elongate, several lower pairs always opposite, the upper ones alternate. Flowers in bracted or naked fasciculate or cymosely disposed spikes or racemes.

Bibliography of the Group and its chief Subdivisions.

Cryptantha Lehm. Del. Sem. Hort. Hamb. iv. (1833); F. & M. Ind. Sem. Hort. Petrop. ii. 35 (1836); Ann. Sci. Nat. ser. 2, v. 297 (1836); Linnaea xi., Lit. 103 (1837); G. Don, Gen. Syst. iv. 373 (1837); Greene, Pittonia i. 110–120 (1887); Baill. Hist. Pl. x. 373 (1891); Coville, Contr. U. S. Nat. Herb. iv. 164–166 (1893); Greene, Bot. San Francisco Bay Reg. 261–262 (1894); Gürke in E. & P. Nat. Pflanzenf. iv. Abt. 3a, 110 (1893); Rydb. [Fl. Mont.] Mem. N. Y. Bot. Garden i. 330–332 (1900); Howell, Fl. N. W. Amer. 486–489 (1901); Jepson, Fl. W. Mid. Calif. ed 1, 444–446 (1901); ibid. ed. 2, 346–348 (1911); Piper, [Fl. Wash.] Contr. U. S. Nat. Herb. xi. 483–485 (1906); Rydb.

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Krynitzkia F. & M. Ind. Sem. Hort. Petrop. vii. 52 (1841); Ann. Sci. Nat. ser. 2, xvi. 55 (1841); Linnaea xv., Lit. 116 (1841); Endl. Gen. Pl., Suppl. 2, 59 (1842); Meisn. Gen. ii. 366 (1842?); DC. Prodr. x. 134 (1846); Gray, Proc. Am. Acad. xx. 264–277 (1885) and Synop. Fl. N. Am. ii. pt. 1, Suppl. 423–429 (1886) in part; Greene, Bull. Calif. Acad. Sci. i. 203–208 (1885); Coulter, Man. Bot. Rocky Mts. 260–261 (1885) in part; Coulter, [Fl. W. Texas] Contr. U. S. Nat. Herb. ii. 286–287 (1892).

Eritrichium § *Krynitzkia* Gray, Proc. Am. Acad. x. 58–61 (1874) and Synop. Fl. N. Am. ii. pt. 1, 193–197 (1878) in part.

Krynitzkia § *Eukrynitzkia* Gray, Proc. Am. Acad. xx. 267–275 (1885) and Synop. Fl. N. Am. ii. pt. 1, Suppl. 424–428 (1886).

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Lappula § *Pterygium* Post & Kuntze, Lexicon 316 (1904).
Eremocarya Greene, Pittonia i. 58 (1887); Baill. Hist. Pl. x. 373 (1891); Gürke in E. & P. Nat. Pflanzenf. iv. Abt. 3a, 109 (1893), Howell, Fl. N. W. Amer. 483 (1901); Abrams, Fl. Los Angeles ed. 1, 331 (1904); ibid. ed. 2, 304 (1917); Frye & Rigg, Northwest Fl. 326 (1912); Wooton & Standley, [Fl. N. Mex.] Contr. U. S. Nat. Herb. xix. 544 (1915); Rydb. Fl. Rocky Mts. 719 (1917); Davidson & Moxley, Fl. So. Calif. 306 (1923); Johnston, Contr. Grav Herb. n. s. lxviii. 56–57 (1923).
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Johnstonella Brand in Fedde, Repert. in press.

Artificial Key to Species.

Nutlets with margins decidedly winged or knife-like.
  Pedicels usually evident, slender, 1–4 mm. long.
    Nutlets homomorphous.....1. *C. holoptera.*
    Nutlets decidedly heteromorphous.....2. *C. racemosa.*
  Pedicels obscure or none, less than 1 mm. long.
    Nutlets heteromorphous, the odd nutlet abaxial.
      Fruiting calyx ca. 2 mm. long; nutlets 0.6–0.7 mm. long...3. *C. angelica.*
      Fruiting calyx 2.5–3 mm. long; nutlets ca. 1.7 mm. long..4. *C. inaequala.*
    Nutlets homomorphous or if slightly heteromorphous the odd nutlet axial.
      Nutlets lucid, somewhat bent, margin thickish; gynobase narrowly pyramidal.....5. *C. pusilla.*
      Nutlets dullish, straight, margin thin; gynobase subulate.
        Nutlets very obscurely roughened, decidedly plano-convex in cross-section (the back rounded and the face flat).....6. *C. costata.*
        Nutlets tuberculate or muricate, not noticeably plano-convex in cross-section.
          Nutlets solitary or rarely 2; calyx obliquely conical at base.....17. *C. utahensis.*
          Nutlets 4, calyx symmetrical.
            Corolla conspicuous; mature calyx obviously longer than broad.....18. *C. oxygona.*

Corolla inconspicuous; mature calyx usually almost as broad as long. . . . . 19. *C. pterocarya.*
Nutlets with margins rounded or angled, never with marginal wing or knife-like edge.
Nutlets all smooth.
Hairs on calyx uncinate or decidedly arcuate.
Style reaching 1/2–2/3 height of nutlet, this with an open areola. . . . . 53. *C. rostellata*
Style reaching less than 1/2 height of nutlet; groove of nutlet closed.
Nutlets nearly terete, rostrate; hairs on calyx usually encrusted and pale. . . . . 54. *C. flaccida.*
Nutlets decidedly compressed, acute; hairs on calyx smoothish and less pale. . . . . 55. *C. sparsiflora.*
Hairs on calyx straight.
Nutlet with excentric groove.
Nutlets 1; flowers axillary, not biserial. . . . . 57. *C. glomeriflora.*
Nutlets 4; flowers in biserial naked spikes. . . . . 56. *C. affinis.*
Nutlet with a centrally placed groove.
Spikes bracteate.
Style reaching or a little surpassing the nutlet-tips; nutlets ovate, groove usually simple or nearly so. . . . . 46. *C. leiocarpa.*
Style reaching 2/3–3/4 height of nutlets; nutlets oblong-ovate to lanceolate, groove usually broad-forked.
Stems reddish; nutlets 1, axial. . . . . 16. *C. maritima.*
Stems green; nutlets 1–4, abaxial when solitary.
Corolla less than 1 mm. broad; diffuse prostrate plants. . . . . 51. *C. Brandegei.*
Corolla 1.5–2 mm. broad; sparsely branched erect plants. . . . . 52. *C. Abramsii.*
Spikes naked or with a few bracts at base.
Nutlets broadly ovate.
Corolla conspicuous, 4–7 mm. broad; spikes commonly ternate. . . . . 36. *C. Hendersoni.*
Corolla inconspicuous, 1–2 mm. broad; spikes usually solitary or geminate.
Spikes usually geminate; inflorescence projected above the leafy mass of plant, well defined. 38. *C. Torreyana.*
Spikes usually solitary, not sharply differentiated from the leafy peduncular stems.
Nutlets homomorphous; Montana and Colorado westward. . . . . 40. *C. ambigua.*
Nutlets slightly heteromorphous; Colorado and Wyoming. . . . . 20. *C. Pattersoni.*
Nutlets oblong-ovate to lanceolate.
Style reaching 1/4–3/4 height of nutlets, these 1–4.
Calyx densely appressed hispid-villous, commonly lacking conspicuous spreading bristles; desert interior. . . . . 44. *C. gracilis.*
Calyx sparsely hispid-strigose and evidently spreading-hirsute; coastal slopes of California.
Hairs on upper part of calyx-lobes conspicuously retrorse. . . . . 49. *C. nemaclada.*

Hairs on upper part of calyx-lobes spreading or ascending.
Style reaching to 2/3–3/4 height of nutlets. 50. *C. Clevelandi.*
Style reaching to 1/4–1/2 height of nutlets. 48. *C. microstachys.*
Style almost reaching the nutlet-tips or surpassing them.
Margin of nutlets acute, at least above the middle.
Corolla conspicuous; style clearly surpassing nutlets, these 2–2.5 mm. long. . . . .42. *C. mohavensis.*
Corolla inconspicuous; style reaching to the nutlet-tips or a trifle surpassed by them; nutlets 1.2–2 mm. long. . . . . .43. *C. Watsoni.*
Margin of nutlets rounded or obtuse.
Groove of nutlet opened below into a triangular areola; plants usually with a definite central axis; not Californian. .45. *C. Fendleri.*
Groove of nutlet closed throughout; plants irregularly branched; Californian. .47. *C. hispidissima.*
Nutlets all rough or at least some of them so.
Nutlets decidedly heteromorphous.
Mature calyces strongly appressed to the flattened rachis; decidedly gibbous on axial side, persistent. . . .14. *C. dumetorum.*
Mature calyces somewhat spreading, nor at all gibbous.
Fruiting calyces widely spreading or reflexed, most hirsute on axial side. . . . . .13. *C. echinosepala.*
Fruiting calyces ascending, most hirsute on abaxial side.
Odd nutlet abaxial, surpassed by style.
Spikes bracteate throughout; calyx persistent. 7. *C. micrantha.*
Spikes naked or nearly so; calyx deciduous.
Pedicels slender, 1–4 mm. long. . . . . .2. *C. racemosa.*
Pedicels stout and obscure, less than 1 mm. long.
Nutlets 0.6–0.7 mm. long. . . . . .3. *C. angelica.*
Nutlets 1–1.7 mm. long.
Nutlets 1.3–1.7 mm. long; calyx 2–3 mm. long. . . . . .4. *C. inaequata.*
Nutlets ca. 1 mm. long; calyx 3–4 mm. long. . . . . .8. *C. angustifolia.*
Odd nutlet axial; style surpassed or occasionally reachng to the nutlet-tips.
Nutlets small 0.7–0.9 mm. long, triangular-ovate. 15. *C. micromeres.*
Nutlets larger, 1–2.3 mm. long, ovate to lanceolate.
Odd nutlet smooth and shiny. . . . . .16. *C. maritima.*
Odd nutlet tuberculate or papillate.
Spikes bracteate. . . . . .23. *C. minima.*
Spikes naked.
Odd nutlet spinular-muricate; calyx-lobes conspicuously thickened. . . . . .24. *C. crassisepala.*
Odd nutlet more or less granulate; calyx-lobes moderately thickened.
Nutlets ovate, smoothish or sparsely tuberculate, odd one ca. 1.9 mm. long. . . . . .20. *C. Pattersoni.*

Nutlets lanceolate or narrowly ovate, coarsely tuberculate, odd one 2–2.6 mm. long.....22. *C. Kelseyana.*
Nutlets homomorphous or practically so.
Calyx circumscissile.....10. *C. circumscissa.*
Calyx not circumscissile.
Style surpassing the nutlets.
Spikes bracted throughout.
Groove of nutlet broadly dilated to form a triangular areola occupying much of the ventral side of nutlet; gynobase narrowly pyramidal..11. *C. albida.*
Groove of nutlet narrow, scarcely dilated below; gynobase subulate.....7. *C. micrantha.*
Spikes sparingly if at all bracted.
Nutlets bent, lucid; gynobase narrowly pyramidal.....5. *C. pusilla.*
Nutlets straight, usually dull; gynobase subulate.
Nutlets small, 0.5–0.7 mm. long.....9. *C. Grayi.*
Nutlets larger, 1.5–3 mm, long.
Nutlets triangular-ovate, with a suggestion of a medial dorsal ridge; plant dull dark green.....32. *C. muricata.*
Nutlets ovate to lance-ovate; plants canescent.
Spikes solitary.....26. *C. patula.*
Spikes commonly ternate or occasionally geminate or quinate.....28. *C. intermedia.*
Style definitely surpassed by or about reaching to the tips of the nutlets.
Corolla conspicuous, 2–5 mm. broad.
Calyx evidently pedicellate, conspicuously long-villous, not hispid or hirsute.....34. *C. crinita.*
Calyx sessile or subsessile, hirsute or hispid, at most inconspicuously short-villous.
Normally only 1 or 2 nutlets developing; gynobase short or medium-sized.
Nutlets usually horizontal, ovate-triangular, acuminate; calyx-lobes shorter than nutlet, very loosely connivent.....35. *C. excavata.*
Nutlets always erect, ovate-oblong or narrowly ovate; calyx-lobes evidently surpassing nutlets and closely connivent over them.
Abaxial nutlet developing; gynobase reaching 1/3–1/2 height of nutlet.....25. *C. decipiens.*
Axial nutlet developing; gynobase about 2/3 height of nutlet.....17. *C. utahensis.*
Normally all 4 nutlets developing; gynobase elongate, 2/3–3/4 height of nutlets.
Plant low, spreading and widely branched; spikes solitary.....33. *C. mariposae.*
Plant erect and ascendingly branched; spikes geminate or ternate.
Hairs on calyx subinflated, extremely coarse; stem usually stiffly erect and forming a conspicuous axis, branches

usually widely divaricate.....27. *C. foliosa.*
Hairs on calyx slender, not notably coarse; stem irregularly branched.
Calyx-lobes pungent-hirsute; nutlets oblong-ovate, verrucose.....28. *C. intermedia.*
Calyx-lobes densely hispid; nutlets ovate, tuberculate.....36. *C. Hendersoni.*
Corolla inconspicuous, 0.5–2 mm. broad.
Ovules 2, nutlet and calyx bent.....12. *C. recurvata.*
Ovules 4; nutlets and calyx straight.
Nutlets very small, ca. 1.5 mm. long; spikes somewhat bracted.....37. *C. Traskae.*
Nutlets larger, 2–3 mm. long, spikes very sparingly if at all bracteate.
Nutlets usually solitary; gynobase 1/4–1/2 height of nutlet.
Nutlet persistent, axial.....21. *C. texana.*
Nutlet finally deciduous, abaxial....25. *C. decipiens.*
Nutlets usually 4.
Nutlets decidedly ovate.
Plant closely strigose, pallid, usually 2–3 dm. tall; spikes commonly geminate or ternate.....39. *C. simulans.*
Plant spreading-hispid, usually 1–1.5 dm. tall; spikes usually solitary or rarely geminate.
Nutlets with low rounded tubercula-tions.....40. *C. ambigua.*
Nutlets with elongate papillae or spicules.....41. *C. echinella.*
Nutlets more or less lanceolate.
Stems spreading hirsute.....29. *C. barbigera.*
Stems strigose.
Nutlets verrucose or verrucose-muriculate.....30. *C. nevadensis.*
Nutlets spinular-muricate.....31. *C. scoparia.*

Description and Classification of the Species.

Ser. I. ANGUSTIFOLIAE. Nutlets 4, muricate or tuberculate, dark with pale roughenings, triangular-ovate or triangular-oblong, with sides acute or knife-like or definitely winged, homomorphous or in most species decidedly hetermorphous with odd nutlet abaxial larger and sometimes slightly less roughened than the others; style definitely surpassing the nutlets.

Pedicels slender, 1–4 mm. long; long-lived annuals.
Nutlets homomorphous, broadly winged.....1. *C. holoptera.*
Nutlets heteromorphous, narrowly winged.....2. *C. racemosa.*
Pedicels stout and very short, less than 1 mm. long.
Nutlets with a knife-like margin.
Nutlets heteromorphous.

Fruiting calyces ca. 2 mm. long; nutlets 0.6–0.7 mm. long.....3. *C. angelica.*
Fruiting calyces 2.5–3 mm. long; nutlets ca. 1.7 mm. long.
4. *C. inaequata.*
Nutlets homomorphous.
Nutlets coarsely tuberculate, bent; gynobase narrowly pyramidal.....5. *C. pusilla.*
Nutlets very obscurely roughened, straight; gynobase subulate.....6. *C. costata.*
Nutlets with merely a sharply angled margin.
Spikes bracteate throughout; style thick.....7. *C. micrantha.*
Spikes bractless or practically so; style slender.
Nutlets heteromorphous.....8. *C. angustifolia.*
Nutlets homomorphous.....9. *C. Grayi.*

1. **C. holoptera** (Gray) Macbr. Coarse erect annual, herbaceous or rarely somewhat suffruticose towards the base, 1–6 dm. tall; branches rather numerous and ascending, hirsute as well as strigose, usually drying brownish; leaves oblanceolate to lance-linear, 3–6 cm. long, 3–8(–12) mm. broad, acute or obtuse, coarsely pustulate and hirsute beneath but less so above; racemes geminate, naked or sparsely bracteate, usually ca. 5 cm. but becoming 10 cm. long; corolla inconspicuous, tube shorter than calyx, the ovate lobes ascending and less than 1 mm. long; fruiting calyx oblong-ovate, 2.5–3.5 mm. long, subsymmetrical, rather persistent; pedicels ascending or decurved, 0.7–1.5 mm. long; mature calyx-lobes lanceolate, somewhat connivent, midrib thickened and hirsute, margins strigose; nutlets 4, homomorphous, 1.5–2.5 mm. long, body oblong-ovate or triangular-ovate, dark with pale tuberculations, margin narrowly to quite broadly winged, groove open or closed above but dilated into an areola below; gynobase slender, about equalling the nutlets; style clearly surpassing the nutlets but shorter than calyx-lobes.—Contr. Gray Herb. n. s. xlviii. 44 (1916). *Eritrichium holopterum* Gray, Proc. Am. Acad. xii. 81 (1876). *Krynitzkia holoptera* Gray, l. c. xx. 276 (1885). *Oreocarya holoptera* Greene, Pittonia i. 58 (1887).

Deserts of California and western Arizona. Not common.

Arizona: Ehrenberg, 1876, *Palmer* (G, type); near Peach Springs, Grand Canyon, 1884, *Lemmon* (UC). California: sandy places near Palm Springs, 120 m. alt., *Spencer 2066b* and *2070* (G); Marshall Canyon, 16 km. west of Coachella, 90 m. alt., *Hall 5786* and *5788* (UC); Calexico, *Davy 8007* (UC); rocky talus slopes at foot of The Needles, *Grinnell* (UC); "The Caves," sink of the Mohave River, *Parish 9855* (UC).

This species was founded by Gray on two collections cited thus: "S. Utah, Capt. F. M. Bishop; Ehrenberg, Arizona, Palmer." The material collected by Bishop is an immature scrappy specimen of *C. pterocarya*. Palmer's Ehrenberg collection consists of two mounted

sheets with fruit. As would be suspected almost the whole of Gray's original description is based upon the Arizonian plant. Subsequently Gray excluded Bishop's collection and cited only the Ehrenberg material as representative of his species. For these reasons Palmer's Ehrenberg collection is taken as the type of *C. holoptera*.

2. **C. racemosa** (Wats.) Greene. Long-lived annual often decidedly suffruticose towards the base, 1–10 dm. tall; stems single with numerous ascending branches or many and diffusely branched, younger parts green, inconspicuously strigose and commonly hirsute, older parts woody and becoming brown from the falling away of the pale bark; leaves oblanceolate, acute, hirsute, pustulate, the early ones 3–6 cm. long and 6–12 mm. broad, the later and more abundant 1.5–4 cm. long and 2.5 mm. broad; racemes apparently forked and paniculately disposed, inconspicuously and irregularly bracted, 3–15 cm. long; corolla very inconspicuous, limb ca. 1 mm. broad; fruiting calyces oblong-ovate, ascending, 2–4 mm. long, slightly asymmetrical, tardily deciduous, inconspicuously biserial; pedicels usually well developed, 1–4 mm. long, slender, frequently nodding; mature calyx-lobes lance-linear, somewhat strigose, hirsute along the thickened midrib; nutlets 4, heteromorphous, triangular-ovate, the acute tips slightly out-curved, groove open or closed above but below broadening cut into a shallow broadly triangular areola; odd nutlet next the abaxial calyx-lobe, 1–2 mm. long, subpersistent, finely muricate or tuberculate or both, light or dark; consimilar nutlets 0.8–1.5 mm. long, acute, tending to be very narrowly winged, dark with pallid tuberculations; gynobase subulate, ¾ length of odd nutlet and about equalling consimilar nutlets; style much surpassing the nutlets, almost as long as the mature calyx-lobes.—Pittonia i. 115 (1887); Johnston, Proc. Calif. Acad Sci. ser. 4, xii. 1147 (1924). *Eritrichium racemosum* Wats in Gray, Proc. Am. Acad. xvii. 226 (1882). *Krynitzkia racemosa* Greene, Bull. Calif. Acad. Sci. i. 208 (1885). *Johnstonella racemosa* Brand, Fedde Repert. in press. *K. ramosissima* Gray, l. c. xx. 277 (1885). *C. suffruticosa* Piper, Proc. Biol. Soc. Wash. xxxii. 42 (1919). *C. racemosa*, var. *lignosa* Johnston, Univ. Calif. Pub. Bot. vii. 445 (1922). *J. racemosa*, var. *lignosa* Brand, Fedde Repert. in press.

Southern Nevada and western Arizona, and southwestward to middle Lower California and Carmen Island; usually growing in rocky places.

NEVADA: semishaded places, Las Vegas Mts., *Goodding 2381* (G, UC); Petrified Forest Canyon west of Logan, 540 m. alt., *Heller 10446* (G) and *10447*

(G, UC); rocks, Ash Meadows, *Purpus 6024* (UC). ARIZONA: Gran l Canyon, 1885, *Gray* (G); Diamond Creek Canyon, *Wilson 170* (UC). CALIFORNIA: on and about rocks, Silver Canyon, White Mts. east of Laws, *Heller 8209* (G); Panamint Canyon, *Hall & Chandler 7034* (UC, TYPE of *C. racemosa*, var. *lignosa*); Surprise Canyon, *Parish 10125* (UC); Morongo Wash, 900 m. alt., *Parish 3337* (UC); among rocks on canyon-side, Palm Canyon, 300 m. alt., *Johnston 1002* (G); sandy places near Palm Springs, 120 m. alt., *Spencer 2079* (G); among rocks, Cathedral Canyon near Palm Springs, 150 m. alt., *Spencer 2078* (G); Borregos Springs, 1894, *Brandegee* (UC); San Felipe Creek, *Eastwood 2704* (G); Split Mt., 1905, *Brandegee* (UC); canyon near Mesquite Station, *Parish 775* (G, TYPE of *E. racemosum*; UC, ISOTYPE); desert sand, Colorado Desert, San Diego Co., *Spencer 254* (G). LOWER CALIFORNIA: Cantillas Mts., 1883, *Orcutt* (G); Cantillas Mts., 1884, *Orcutt* (G, UC); San Julio Canyon, 1889, *Brandegee* (UC); San Sebastian, 1884, *Brandegee* (UC); San Reguis, 1889, *Brandegee* (UC); Santa Maria, 1889, *Brandegee* (UC); Cajon de Santa Maria, 1889, *Brandegee* (UC); talus, Puerto Refugio, Angel de la Guarda Island, *Johnston 3374* (G); shaley slope, San Estaban Island, *Johnston 3175* (G); cobble-stone beach, South San Lorenzo Island, *Johnston 4192* (G); foot of cliff, Las Animas Bay, *Johnston 3505* (G); Santa Rosalia, *Palmer 188* (G); foot of gypsum cliff, San Marcos Island, *Johnston 3621* (G); Carmen Island, *Palmer 846* (G, UC).

A very distinctive plant to be confused only with *C. holoptera*, which has homomorphous, more broadly winged nutlets. The very diffusely branched form of *C. racemosa*, which is most common in the Mohave Desert, has been described as *C. racemosa*, var. *lignosa*. It may be worthy of recognition.

3. **C. angelica** Johnston. Much branched finely strigose herb 15–25 cm. high; stems spreading, rebranched, brown and glabrous below, strigose and canescent above; leaves linear, 8–24 mm. long, 1–2 mm. broad, loosely strigose, densely and minutely pustulate, ascending; spikes solitary, crowded, slender, naked, 4–9 cm. long, very floriferous; corolla minute, ca. 1 mm. long, ca. 0.5 mm. broad; fruiting calyces oblong-ovate, 1.5–2 mm. long, ascending, subsessile, somewhat asymmetrical; mature calyx-lobes linear, erect, ribbed, sparsely hispid, abaxial one slightly the longest and most hispid; nutlets 4, hetermomorphous, triangular-ovate, dark with small pale tuberculations, margins sharp and with a very narrow knife-edge, back convex, groove closed above but dilated below into a shallowly triangular areola; odd nutlet next the abaxial calyx-lobe, ca. 0.7 mm. long, somewhat persistent; consimilar nutlets ca. 0.6 mm. long; gynobase narrow, almost as long as the consimilar nutlets; style very much surpassing the nutlets.—Proc. Calif. Acad. Sci. ser. 4, xii. 1143 (1924).

Known only from Angel de la Guarda Island in the Gulf of California.

LOWER CALIFORNIA: on silty flats, Angel de la Guarda Island opposite Pond Island, *Johnston 4221* (G, UC, ISOTYPES).

A well marked species, probably most related to *C. racemosa*, from which it differs in such developments as smaller and sessile calyces, much smaller nutlets, and narrower leaves. To judge from the description of *C. inaequata* it differs from that species in its denser spikes, and much smaller calyces and nutlets. Except for the very narrowly winged margin, the nutlets of *C. angelica* are very suggestive of those of *C. Grayi*.

4. **C. inaequata** Johnston. Loosely and sparingly branched herb 3–4 dm. high; stems erect or ascending, hispid and strigose or hirsute towards the base; leaves oblanceolate to linear, 2–4 cm. long, acute, not numerous, more or less hispid, pustulate especially underneath; spikes geminate or solitary, 4–12 cm. long, at times sparsely bracted below; corolla inconspicuous, tube shorter than calyx; fruiting calyx ovate-oblong, 2.5–3 mm. long, ascending, pedicels less than 0.5 mm. long; mature calyx-lobes lanceolate, midrib thickened and hirsute, axial lobe most pubescent and thickened; nutlets 4, heteromorphous, triangular-ovate, dark with small pale tuberculations, margins decidedly acute, groove closed above but below gradually dilating into a shallow triangular areola; odd nutlet ca. 1.7 mm. long, somewhat persistent, slightly lighter than the others, next the abaxial calyx-lobe; consimilar nutlets ca. 1.3 mm. long; gynobase equalling the consimilar nutlets but surpassed by odd nutlet; style much surpassing the nutlets.—Univ. Calif. Pub. Bot. vii. 444 (1922). *Johnstonella inaequata* Brand, Fedde Repert. in press.

Southeastern California.

California: among rocks, Pleasant Canyon, Panamint Mts., 600 m. alt., *Hall & Chandler 6925* (UC, type); Baxter, *Parish 9859* (UC).

The status of this species is problematic, since the collections upon which it was based have not neen available to me for several years. The description given above is adapted from a preliminary diagnosis made in 1922. It is possible that the plant is only a form of *C. racemosa*, although it has been noted as differing in its subsessile calyces and less extended duration.

5. **C. pusilla** (T. & G.) Greene. Low plant usually with very numerous prostrate-ascending stems; these very slender, usually strictly branched, 3–15 cm. long, canescent, appressed villous-hirsute; leaves crowded near base of plant but distant above, spathulate-linear to linear, 1–3 cm. long, 1–2 mm. wide, somewhat pustulate and hispid below but less so above; spikes solitary or geminate, 2–8 cm. long, naked or with a few minute bracts; corolla inconspicuous, shorter than calyx, 1.5–2 mm. long, lobes slightly spreading oblong ca. 0.3

mm. long; fruiting calyces 2–2.5 mm. long, broadly ovate, symmetrical, sessile or subsessile, early deciduous; mature calyx-lobes lance-ovate or oblong-lanceolate, hirsute, midrib only slightly thickened; nutlets 4, homomorphous, lucid, ca. 0.8–1.2 mm. long, triangular-ovate, bent, tan-colored with low light-colored tuberculations, margin angled and beveled, groove opened or closed above but expanding below into a shallow open triangular areola; gynobase narrowly pyramidal, about equalling the nutlets; style much surpassing the nutlets, ca. ½ length of gynobase.—Pittonia i. 115 (1887). *Eritrichium pusillum* T. & G. Pacif. R. R. Rep. ii. pt. 2, 171 (1856). *Krynitzkia pusilla* Gray, Proc. Am. Acad. xx. 274 (1885).

Southern Arizona and New Mexico southward to Durango.

Arizona: near Nogales, 1902, *Orcutt* (UC); Douglas, 1907, *Goodding 2264* (UC). New Mexico: without locality, *Wright 1571* (G, NY). Texas: Fort Davis, 1880, *Giard 65* (G); Kent, *Tracy & Earle 105* (UC); El Paso, *Jones 3741* (UC); Llano Estacado, *Pope* (NY, type). Chihuahua: hills and plains near Chihuahua, *Pringle 184* (G, UC); vicinity of Chihuahua, 1300 m. alt., *Palmer 65* (G). Durango: Tepehuanes, *Palmer 28* (G, UC); Durango, *Palmer 139* (G, UC) and *227* in pt. (G).

A very distinct species readily recognized by its beveled, bent, lustrous nutlets that just equal the somewhat basally constricted gynobase. The type is given as coming from "Rio Pecos to Llano Estacado, etc. in sandy soil, March." From a study of the journal in Pope's Report, the locality given is found to be within about 100 kilometers traveled between March 24th and 26th 1854. This would make the type locality lie somewhere near the juncture of Ward, Crane and Ector counties, Texas.

6. **C. costata** Brandg. Coarse stiff few-branched herb 1–2 dm. high; stems (especially younger parts) canescent, densely villous-strigose and usually somewhat hirsute as well; leaves lanceolate to linear, 1–3 cm. long, 2–4 mm. wide, broadest near base, apex acute, above villous-strigose and sparsely hispid, beneath more hispid and frequently also pustulate; spikes rigid, 2–5 cm. long, solitary or geminate, sparsely leafy-bracted; corolla inconspicuous, ca. 2 mm. long, tube shorter than calyx, lobes broad and ascending; fruiting calyces ovate-oblong, 4–6 mm. long, subsymmetrical, spreading, deciduous, subsessile; mature calyx-lobes linear-lanceolate, somewhat connivent above with tips slightly spreading, midrib thickened hirsute, margins strigose; nutlets 4, homomorphous or subheteromorphous with the nutlet next the abaxial calyx-lobe slightly the largest, ca. 1.8 mm. long, triangular oblong-ovate, back strongly convex, inconspicuously rugulose or faintly verrucose, face noticeably flat or even

slightly convex, margins sharp and narrowly winged; groove very shallow, closed above but dilating below and merging into the deltoid shallow areola; gynobase subulate, equalling the nutlets; style not sharply differentiated from the gynobase, much surpassing the nutlets.—Bot. Gaz. xxvii. 453 (1899). *C. scorsa* Macbr. Contr. Gray Herb. n. s. xlviii. 46 (1916).

Deserts of Southern California.

California: Needles, *Jones 3841* (G, type of *C. scorsa;* UC, isotype); gravelly hillside 17 km. west of Needles, 210 m. alt., *Munz & Harwood 3601a* (UC); sandy desert, Blythe Junction, 360 m. alt., *Munz & Harwood 3587* (UC); in desert sand near mouth of Tahquitz Canyon, 210 m. alt., *Spencer 1524* (G); in sand, Palm Canyon, 180 m. alt., *Spencer 1527* (G); margin of wash, Borregos Spring, 1889, *K. Brandegee* (UC); Borregos Spring, 1895, *Brandegee* (UC, type of *C. costata);* Hodges Mts., *Hall 5974* (UC); sand hills near Travertine Terrace, 52 m. below sea-level, *Parish 8429* (UC); in desert sand, Mecca, 57 m. below sea-level, *Spencer 1514* (G); Mecca, 60 m. below sea-level, *Parish 8465* (G).

A very distinct species readily recognized by its peculiar nutlets and by its rather coarse, stiff habit and very canescent herbage.

7. **C. micrantha** (Torr.) Johnston. Slender strigose ascendingly branched dichotomous herb 5–15 cm. high, drying brownish; root and lower parts of stem stained with dye; leaves oblong-oblanceolate, 3–7 mm. long, 0.8–1.4 mm. broad, canescent-strigose and occasionally short villous-hirsute, rounded at apex, uppermost scarcely reduced and extending through the inflorescence; spikes very numerous, solitary or geminate, dense, strongly unilateral, leafy-bracted throughout, 1–4 cm. long; corolla inconspicuous or medium-sized, limb 0.5–2.5 mm. broad, faucal appendages poorly developed; fruiting calyx ovate-oblong, 1.8–2.5 mm. long, slightly asymmetrical, decidedly biseriate, base broadly conical; pedicels 0.5–0.8 mm. long; mature calyx-lobes oblong-lanceolate, broad, erect, hirsute, midrib not particularly thickened; nutlets 4, homomorphous or somewhat heteromorphous, 1–1.3 mm. long, plumbeous or brown, smooth or tuberculate, abaxial one usually a trifle the largest and most persistent; groove extending full length of nutlet, narrow, scarcely broadened at base; gynobase subulate, nearly as long as the calyx, much surpassing the nutlets and bearing at its summit the sessile stigma.—Contr. Gray Herb. n. s. lxviii. 56 (1923).

Var. **genuina.** Corolla inconspicuous, 0.5–1.2 mm. broad.—*Eritrichium micranthum* Torr. Bot. Mex. Bound. 141 (1859). *Krynitzkia micrantha* Gray, Proc. Am. Acad. xx. 275 (1885). *Eremocarya micrantha* Greene, Pittonia i. 59 (1887). *C. micrantha* Johnston, l. c.

Eremocarya muricata Rydb. Bull. Torr. Bot. Cl. xxxvi. 677 (1909); Macbr. Proc. Am. Acad. li. 545 (1916).

Southeastern Oregon to Utah, southward to northern Lower California and Arizona, and eastward along the Mexican boundary to western Texas.

Oregon: without locality, 1898, *Cusick 2020a* (G). Utah: Stansbury Island, 1290 m. alt., *Watson 856* (G); valley of the Virgin near St. George, *Parry 164* (G, isotype of *E. muricatum*). Nevada: Logan, *Kennedy 1832* (G); dry sandy ravines, Moapa, *Goodding 2203* (G); deep sand, Beaver Dam Wash, *Goodding 2144* (G). California: sandy place, Mohave Desert, 300 m. alt., *Spencer 436* (G); Barstow, *Jones 106* (G); Mohave Desert, 1880, *Lemmon* (G); Acton, *Elmer 3682* (G); Los Angeles, 1880, *Nevin* (G); sand in Arroyo Seco, Pasadena, *Allen 18* (G); dry sandy ground, San Gabriel Wash near El Monte, *Johnston 27r* (G); San Bernardino, 1876, *Parry 14* (G); sandy hills, Mesa Grande, 990 m. alt., *Spencer 1304* (G); Agua Caliente, *Parish 771* (G); sandy place near Palm Springs, 120 m. alt., *Spencer 1918* (G); desert sand, Palm Springs, 135 m. alt., *Spencer 844* (G); desert sand, Coyote Wells, *Spencer 194* (G); desert sand, Mecca, 59 m. below sea-level, *Spencer 1515* (G); desert sand, Mountain Springs, 678 m. alt., *Spencer 857* (G). Lower California: San Sebastian, 1889, *Brandegee* (UC); without locality, 1883, *Orcutt* (G). Arizona: near Tucson, *Greene 1112* (G); Wickinburg, *Palmer 371* (G); near Camp Lowell, 1881, *Pringle* (G); Prescott, *Rusby 745* (G). New Mexico: without locality, 1851-2, *Wright 1565* (G). Texas: sands along Rio Grande, El Paso, *Thurber 181* (G); El Paso, *Jones 3703* (G).

Var. **lepida** (Gray) Johnston. Corolla medium-sized, 1.0–1.5 mm. broad; plants usually coarser than in var. *genuina*.—Contr. Gray Herb. n. s. lxviii. 57 (1923). *Eritrichium micranthum*, var. *lepidum* Gray, Synop. Fl. N. Am. ii. pt. 1, 193 (1886). *Krynitzkia micrantha*, var. *lepida* Gray, Proc. Am. Acad. xx. 275 (1885). *Eremocarya lepida* Greene, Pittonia i. 59 (1887). *Eremocarya micrantha*, var. *lepida* Macbr. Proc. Am. Acad. li. 545 (1916).

Southern California, most common in warm montane valleys.

California: Middle Fork, Mt. Pinos, *Hall 6540* (UC); Grayback, 1880, *Wright* (G); near Pine Lake, Bear Valley, *Abrams 2904* (G); Forest Home, 1500 m. alt., 1913, *Mason* (G); Bear Valley, *Parish 771a* (G); sandy hills, Idyllwild, 1590 m. alt., *Spencer 1301* (G); woods, Idyllwild, 1620 m. alt., *Spencer 1347* (G); Warners Hot Springs, *Eastwood 2591a* (G); dry canyon floor near Campo, *Abrams 3594* (G); desert sand, Mountain Springs, 678 m. alt., *Spencer 858* (G); San Diego, 1876, *Cleveland* (G, type of *E. micranthum*, var. *lepidum*). Lower California: San Pedro Martir, 1893, *Brandegee* (UC).

The nutlets of *C. micrantha* are exceptionally variable. Some plants have all the nutlets smooth, others have all of them tuberculate, while still others have the abaxial nutlet of each calyx tuberculate and the remaining ones smooth. *Eremocarya muricata* is described as differing from *C. micrantha* in having tuberculate nutlets, but in the isotype of that species contained in the Gray Herbarium I find that

although most of the calyces have roughened nutlets a few of them (and these always the oldest) have decidedly smooth nutlets. In plants characteristically smooth-fruited it is quite common to find that the oldest calyces contain three smooth nutlets and a tuberculate one. Not only is there a decided tendency towards heteromorphism in markings and roughenings, but to a slight degree also in size and firmness of attachment. The abaxial nutlet is commonly a trifle larger than the other nutlets and is somewhat more firmly attached to the gynobase. None of the nutlet-variations can be geographically correlated. Despite its variable fruit the species is readily recognized because of its densely bracteate inflorescence, deeply dye-stained root and long-protruded gynobase.

8. **C. angustifolia** (Torr.) Greene. Diffusely branched from the base, 5–20(–45) cm. tall; stems canescent, villous-hirsute, commonly somewhat strigose-villous, lowermost branches decumbent or loosely ascending; leaves linear, 1.5–4 cm. long, 1–4 mm. wide, spreading, not crowded below, hispid or strigose, somewhat pustulate especially underneath; spikes geminate, usually ca. 5 cm. long, rather dense, commonly naked; corolla usually inconspicuous, tube 1–2 mm. long, limb 1–2.5 mm. broad; fruiting calyces ovate-oblong, 3–4 mm. long, stiffly ascending, strongly biseriate, slightly asymmetrical; pedicels less than 0.5 mm. long; mature calyx-lobes lance-linear, rigid, slightly connivent, midrib thickened and hirsute, margin somewhat villous-ciliate, abaxial lobe longest and most hirsute; nutlets normally 4, heteromorphous, ovate-oblong, brown or plumbeous with pale tuberculations or rarely murications, back convex, face flattish, margin somewhat angular; odd nutlet next the abaxial calyx-lobe, a trifle larger and more persistent than the similarly colored and shaped consimilar nutlets which are ca. 1 mm. long, groove usually narrowly open above but broadening at the base; gynobase columnar, equalled by consimilar nutlets but shorter than odd nutlet; style usually surpassing even the odd nutlet.—Pittonia i. 112 (1887). *Eritrichium angustifolium* Torr. Pacif. R. R. Rep. v. 363 (1857). *Krynitzkia angustifolia* Gray, Proc. Am. Acad. xx. 272 (1885).

Southern California and southern Utah, southward to Lower California, Sonora and western Texas.

CALIFORNIA: Death Valley, *Coville & Funston 479* (G); Danby, 1896, *Orcutt* (UC); Barstow, 1915, *K. Brandegee* (UC); sandy places near Barstow, 960 m. alt., *Spencer 2091* (G); Needles, 1884, *Jones* (G); Riverside Mt., 1910, *Grinnell* (UC); Palm Springs, 1913, *Eastwood* (G); in sandy places, Palm Springs, *Spencer 843, 849, 853, 855, 1526a, 2066a, 2071b* in pt. and *2118* (G); sand dunes, Old Beach, near Holtville, *Parish 8124* (UC); Twentynine Palms,

1902, *Brandegee* (UC); desert sand, Indio, 30 m. alt., *Spencer 1517* (G); sandy wash, Shaver's Well near Mecca, 59 m. below sea-level, *Munz & Keck 4763* (G); sands, Mecca, *Spencer 1512* and *1785* (G); Cameron Lake, *Brandegee* (UC); Yaqui Wells, *Eastwood 2632* (G); bottom lands near Colorado River, 750 m. alt., *Hall 5922* (UC); in sandy places, Colorado Desert, *Spencer 195, 196, 197* and *201* (G); without locality, *Coulter 500* (G). LOWER CALIFORNIA: stony ridges, Los Angeles Bay, *Palmer 606* (G); San Agueda, *Palmer 241* (G, UC); Angel de la Guarda Island, *Johnston 4227* (G). NEVADA: Moapa, *Goodding 2181* (G, UC); Overton, 450 m. alt., *Heller 10439* (G); Amargosa in moist place near station, 900 m. alt., *Heller 10976* (G); sandy wash, Meadow Valley Wash, *Goodding 2169* (G); Muddy Valley, *Kennedy & Goodding 26* (UC). ARIZONA: Fort Yuma, *Thomas* (NY, TYPE); Fort Yuma, *DuBarry* (NY, COTYPE); Gila River, *Thurber 690* (G); Tucson, 1907, *Loyd* (G); Tucson, 1884, *Parish* (G); Tucson, 1894, *Toumey* (UC); campus of University of Arizona, *Thornber 407* and *516* (UC); without locality, 1876, *Palmer* (G); without locality, 1881, *Pringle* (G). SONORA: Torres, 1902, *Purpus* (UC); dry places, Canyon of Guadaloupe, *Smith* (NY); Las Durasnillas, 1892, *Brandegee* (UC); Guaymas, *Palmer 169* (G, UC). NEW MEXICO: mesa west of Organ Mts., 1905, *Wooton* (UC). TEXAS: El Paso, 1884, *Jones* (G).

Probably the most common *Cryptantha* in the lower deserts of California. It is readily recognized by its characteristic ashy herbage, dense spikes, and heteromorphous dark nutlets which are covered with small light colored low tubercles. It is a well marked species, having its closest relation in *C. Grayi*.

9, **C. Grayi** (Vasey & Rose) Macbr. A small slender herb 5–15 (–18) cm. high; stems usually several, strict or spreading, appressed or spreading villous-hispid; leaves quite numerous, linear, 1–4 cm. long, 1–2 mm. wide, densely pustulate-setose beneath but much less so above, basal ones somewhat aggregated, upper ones reduced; spikes usually geminate, naked, densely flowered, 1–4 cm. long; corolla minute to medium-sized, tube shorter than calyx, limb 0.5–3 mm. broad; fruiting calyx oblong-ovate, 1–2 mm. long, sessile or subsessile, decidedly biseriate; mature calyx-lobes lance-linear, rigid, slightly connivent, midrib short-hirsute, margins somewhat villous-hispid, axial lobe most pubescent; nutlets 4, homomorphous, very small, 0.5–0.7 mm. long, triangular-ovate, dark colored, usually bearing light-colored low tuberculations, edges angled or rounded, areola shallow and deltoid with the groove above it commonly closed; gynobase subulate, equalling or a little shorter than the nutlets; style much surpassing the nutlets.—Contr. Gray Herb. n. s. xlviii. 43 (1916).

Var. **genuina.** Corolla conspicuous, 2–3 mm. broad; nutlets tuberculate.—*Krynitzkia Grayi* Vasey & Rose, Proc. U. S. Nat. Mus. xi. 536 (1888). *C. Grayi* Macbr. l. c.

Middle Lower California.

LOWER CALIFORNIA: Lagoon Head, *Palmer 801* (G, UC, ISOTYPES); Calmalli, *Purpus* (UC); Magdalena Island, *Orcutt 27, 52* and *80* (G); Magdalena Bay, 1889, *Brandegee* (UC); Santa Margarita Island, 1889, *Brandegee* (UC).

Var. **nesiotica** Johnston. Corolla inconspicuous, 0.5–1 mm. broad; nutlets very sparsely or not at all tuberculate.—Proc. Calif. Acad. Sci. ser. 4, xii. 1146 (1924).

Dunes on islands in southern part of Gulf of California.

LOWER CALIFORNIA: very common on dunes, San Francisco Island, *Johnston 3947* (G, UC, ISOTYPE).

Var. **cryptochaeta** (Macbr.) Johnston. Corolla inconspicuous, 0.5–1 mm. broad; nutlets abundantly tuberculate.—Proc. Calif. Acad. Sci. ser. 4, xii. 1145 (1924). *C. micromeres*, var. *cryptochaeta* Macbr. Contr. Gray Herb. n. s. xlviii. 46 (1916). *C. filiformifolia* Macbr. l. c. 45.

Extreme southern Lower California and Sonora.

LOWER CALIFORNIA: Cape San Lucas, *Xantus 76* (G); sandy clearings, La Paz, *Johnston 3071* (G); San José del Cabo, *Anthony 347* (G, TYPE of *C. micromeres*, var. *cryptochaeta*). SONORA: Alamos, *Palmer 397* (G, TYPE of *C. filiformifolia;* UC, ISOTYPE); Alamos, *Goldman 308* (G).

Cryptantha Grayi is very closely related to *C. angustifolia*, and from the infrequent extremely slender forms of the latter it is distinguishable only by its decidedly homomorphous nutlets. Usually, however, it is readily recognized by its very slender habit, and by its herbage which usually dries a darker color than that of *C. angustifolia*.

Ser. II. CIRCUMSCISSAE. Nutlets 4, smoothish or inconspicuously muricate, dark, triangular-ovate, with acute sides, homomorphous or subheteromorphous with the abaxial nutlet just appreciably the largest; style equalling or barely surpassing the nutlets; calyx circumscissile at maturity.

10. **C. circumscissa** (H. & A.) Johnston. Low herb 2–10 cm. high, trimly erect or much branched and forming hemispherical masses; stems few to numerous, more or less branched above, strigose or hirsute, the outermost somewhat decumbent; leaves oblanceolate, 3–15 mm. long, 1–2 mm. broad, obtusish, surface siliceous especially toward the pale base, strigose or hirsute, obscurely pustulate, upper ones scarcely reduced and extending through the inflorescence as foliaceous bracts; flowers axillary, the racemose arrangement obscure; corolla more or less inconspicuous, 1–2(–3) mm. broad; fruiting calyx 2.5–4 mm. long, oblong-ovate, united to near the middle, at maturity upper half falling away by a circumscission just below the sinuses;

basal persistent part of calyx-tube siliceous, pale, cupulate, appressed-hirsute; mature calyx-lobes firm-herbaceous, linear-lanceolate, scarcely ribbed, more or less hirsute; pedicels obscure, ca. 0.5 mm. long; nutlets 4, homomorphous or with abaxial one barely the largest, smooth or obscurely muriculate, triangular-ovate or oblong-lanceolate, 1.2–1.7 mm. long, back flattened especially towards apex, margins angled, groove closed and forked below; gynobase about ⅔ height of nutlets, pyramidal-oblong; style equalling or barely exceeded by nutlets.—Contr. Gray Herb. n. s. lxviii. 55 (1923).

Var. **genuina**. Stems with short appressed hairs.—*Lithospermum circumscissum* H. & A. Bot. Beechey 370 (1840). *Piptocalyx circumscissus* Torr. in Wats. Bot. King Exped. 240 (1871); Torr. Bot. Wilkes Exped. 414, t. 12 (1874). *Eritrichium circumscissum* Gray, Proc. Am. Acad. x. 58 (1874). *Krynitzkia circumscissa* Gray, Proc. Am. Acad. xx. 275 (1885). *Wheelerella circumscissa* Grant, Bull. So. Calif. Acad. Sci. v. 28 (1906). *Greenocharis circumscissa* Rydb. Bull. Torr. Bot. Cl. xxxvi. 677 (1909). *C. depressa* Nels. Bot. Gaz. xxxiv. 29 (1902).

Southern British Columbia and Idaho, southward to Arizona and northern Lower California.

Washington: Junction of Coal and Crab creeks, 730 m. alt., *Sandberg & Leiberg 228* (G); in dried up pools, Pasco, *Piper 2966* (G); Ainsworth, 1883, *Brandegee* (G); plains, Morgan's Ferry, Yakima River, *Suksdorf 404* (G). Oregon: open sandy places, Bend, *Nelson 859* (G); dry sandy slope along Des Chutes River, 8 km. below Bend, *Peck 9709* (G); plains between Pineville and Bear Buttes, 1110 m. alt., *Leiberg 324* (G); dry ground, Burns, *Peck 6108* (G). Idaho: Boise, 1881, *Wilcox* (G); dry soil, 11.2 km. west of St. Anthony, *Merrill & Wilcox 873* (G, isotype of *C. depressa*); dry gravelly bottom-land, Falk's Store, *Macbride 29* (G); Snake Country, *Burke* (G); sandy slopes, Emmett, 660 m. alt., *Macbride 786* (G). Utah: Antelope Island, 1290 m. alt., *Watson 847* (G); valley of the Virgin near St. George, *Parry 165* (G); St. George, 1880, *Jones* (UC); without locality, 1873, *Bishop* (G). Nevada: Pyramid Lake, *K. Brandegee* (G, UC); Carson City, 1500 m. alt., *Watson 848* (G); Humboldt Plains, 1872, *Gray* (G); Carson City, *Anderson 163* (G); Lake Washoe, *Torrey 336* (G); near Empire City, *Torrey 332* (G); Reno, 1884, *Curran* (G); log railroad north of Verdi, 1590 m. alt., *Heller 10877* (G); about Carson City, 1446 m. alt., *Baker 973* (G); gravelly soil, Palmetto Range, *Purpus 5841* (G, UC). Arizona: Cottonwood, *Palmer 372* (G). California: Sierra County, 1875, *Lemmon* (G); Tioga Road, east side of the divide, 2550 m. alt., *Smiley 820* (G); sandy plains, South Fork of Kern River, *Purpus 5712* (G, UC); base of White Mts. east of Laws, *Heller 8235* (G); sandy places, Erskin Creek, *Purpus 5304* (G); Acton, *Elmer 3705* (G); hills bordering Mohave Desert, 1882, *Pringle* (G); sand, Mohave, *Heller 7764* (G); desert sand near Victorville, 600 m. alt., 1918, *Spencer* (G); desert sand, Hesperia, *Spencer 387* (G); near Pine Lake, Bear Valley, *Abrams 2905* (G); sandy soil, Jacumba, *Abrams 3659* (G); Cottonwood Springs, *Jaeger 1846* (G). Lower California: without locality, 1884, *Orcutt* (G).

" Var. **hispida** (Macbr.), comb. nov. Stems clothed with spreading bristles; plant usually coarser than in var. *genuina*.—*Greenecocharis circumscissa*, var. *hispida* Macbr. Proc. Am. Acad. li. 546 (1916). *Krynitzkia dichotoma* Greene, Bull. Calif. Acad. Sci. i. 206 (1885). *Piptocalyx dichotomus* Greene, Pittonia i. 60 (1887). *Wheelerella dichotoma* Grant, Bull. So. Calif. Acad. Sci. v. 28 (1906). *Greenecocharis dichotoma* Macbr. l. c. *C. dichotoma* Johnston, Contr. Gray Herb. n. s. lxviii. 55 (1923).

Western Nevada and adjacent California. Infrequently collected.

NEVADA: between Boca and Verdi, 1884, *Curran* (G, ISOTYPE of *K. dichotoma*); Carson City, *Anderson* (G). CALIFORNIA: Andrews Camp, Bishop Creek, 2400 m. alt., *Davidson 2700* (G); trail to Mt. Whitney, 3000 m. alt., *Culberton 4240* (G, TYPE of *G. circumscissa*, var. *hispida*); sandy plains, Erskin Creek, *Purpus 5304* in pt. (G).

A detailed study of *C. circumscissa* and *C. dichotoma* has failed to disclose any fundamental character capable of separating the two. The nutlet-characters used by Gray and Greene are not distinctive, since among plants of indubitable *C. circumscissa* the nutlets not only vary from triangular-ovate to oblong-lanceolate, but also from smooth and shiny to very finely granulate and minutely muriculate. The size of the nutlets does not separate natural groups. The only tangible character separating *C. circumscissa* and *C. dichotoma* seems to be one of pubescence. Since all the material with spreading bristles comes from a definite region along the east base of the Sierra Nevada I believe that this hirsute form is best treated as a geographical variety. Consequently Macbride's varietal name is taken up. It is to be noted that annotations in the Gray Herbarium indicate that even Gray inclined towards treating *C. dichotoma* as a mere variety.

Ser. III. ALBIDAE. Nutlets 4, coarsely tuberculate, dark, triangular-ovate, thickish, very broadly obtuse or convex on the sides, homomorphous but with the abaxial nutlet subpersistent; style much surpassing the nutlets.

11. **C. albida** (HBK.) Johnston. An erect or frequently loosely ascending herbaceous or fruticulose plant 1–3(–4) dm. high; stems solitary or usually several, simple or commonly paniculately branched, more or less villous-strigose as well as hirsute; early leaves in evanescent basal rosettes, spathulate, becoming 5 cm. long, 1.5–4 mm. wide; cauline leaves numerous and somewhat crowded, reduced above but extending as linear bracts through the inflorescence, 3 cm. or less long, hirsute, usually minutely pustulate; spikes 1–7 cm. long, solitary,

numerous, loosely bracteate; corolla inconspicuous, ca. 2.5 mm. long, tube about equalling calyx; fruiting calyx broadly ovate, 2–3 mm. long, only slightly accrescent, becoming remote, subpersistent; mature calyx-lobes oblong-ovate to lance-ovate, loosely connivent, midrib slightly thickened and short-hirsute, margin appressed-hispid; pedicels ca. 0.5 mm. long; nutlets 4, homomorphous, triangular ovate, 1–1.5 mm. long, tan or brownish, usually sparsely granulate, low-tuberculate, thickish, one next abaxial calyx-lobe subpersistent, margins rounded, ventral side occupied by a very large open triangular areola which appears to be excavated in very mature nutlets by the breaking away of the attachment-scar from the nutlet-walls; gynobase narrowly pyramidal, about equalling the nutlets; style much surpassing nutlets. —Contr. Gray Herb. n. s. lxviii. 53 (1923). *Myosotis albida* HBK. Nov. Gen. et Sp. iii. 91 (Aug. 1818). *Lithospermum ramosum* Lehm. Asperif. ii. 328 (Nov. or Dec. 1818). *Eritrichium ramosum* A. DC. Prodr. x. 132 (1846). *Krynitzkia ramosa* Gray, Proc. Am. Acad. xx. 274 (1885). *C. ramosa* Greene, Pittonia i. 115 (1887). *E. hispidum* Buckley, Proc. Acad. Philad. 1861, pg. 462 (1861). *K. mexicana* Brandg. Zoe v. 182 (1904); Macbr. Contr. Gray Herb. n. s. xlviii. 49 (1916).

Western Texas to eastern Arizona in the vicinity of the international boundary, thence south to Durango and Puebla.

Texas: Davis Mts., *Tracy & Earle 176* (G); Maxon Springs, *Havard 46* (G); valley of Limpia, 1858, *Hayes* (G); Pecos, 1858, *Hayes* (G); without locality, 1874, *Buckley* (G, fragment of TYPE of *E. hispidum*); without locality, *Wright 1572* and *488* in pt. (G). Arizona: waste land, Douglas, *Goodding 2395* (G); sandy plain near the Mustang Mts., 1884, *Pringle* (G). Coahuila: Rio Grande Valley near Diaz, 200 m. alt., *Pringle 8301* (G, UC); mts. 10 km. east of Saltillo, *Palmer 2046* (G); Urios, 72 km. east of Saltillo, *Palmer 896* (G); vicinity of Saltillo, *Palmer 243* and *343* (G); Parras, *Purpus 2402* (G, UC); dry places southwest of Encantada, 1847, *Gregg* (G); Viesca, *Purpus 126* (UC, TYPE of *K. mexicana*; G, ISOTYPE); without locality, *Gregg 32* (G). Chihuahua: foothills of Sierra Madra near Colonia Juarez, *Nelson 6343* (G). Durango: City of Durango, *Palmer 227* (G, UC). San Luis Potosi: San Luis Potosi, *Parry & Palmer 623* (G); San Rafael Mts., *Schaffner 731* (G). Aguas Calientes: in fields, Aguas Calientes, *Hartweg 157* (G). Hidalgo: between San Juan del Rio and Hacienda de San Antonio, *Humboldt* (G, authentic fragment of *M. albida*). Mexico: sandy fields, Amecameca, *Pringle 6648* (G, UC); San Juan Teotihuacan, District of Tezcoco, *Seler 5304* (G). Puebla: Mt. Orizaba, 3000 m. alt., *Seaton 173* (G).

The nutlets of this species are very thick in relation to their breadth. This condition, as well as the very large open (in age excavated) triangular areola, makes the species readily recognizable. It is practically confined to eastern Mexico where in Puebla it sets the southernmost outpost for the genus in North America. Not only is it the

most southerly ranging of the North American species, but it is the only North American species which appears to have its immediate relationships in the continent to the south. *Cryptantha albida* is very closely related to *C. argentinica* Brand of northern Argentina, if indeed it is not the same species.

Ser. IV. MARITIMAE. Nutlets 1–4, tuberculate or muricate, usually dark with pale roughenings, lanceolate to triangular-ovate, with rounded or obtuse sides, decidedly heteromorphous with odd nutlet (sometimes alone developing) axial and larger as well as occasionally less roughened than others; style surpassed by the nutlets or reaching their tips or rarely surpassing them.

Calyx most hirsute on axial side, conspicuously recurved or deflexed.
  Ovules 2; nutlet 1, bent; style reaching to about 1/2 height of nutlet.....12. *C. recurvata.*
  Ovules 4; nutlets 4, straight; style reaching to about the tips of the nutlets.....13. *C. echinosepala.*
Calyx most hirsute on abaxial side, spreading to strict.
  Calyx strictly and closely appressed to the flattened rhachis, gibbous on axial side due to basal prolongation of rough odd nutlet.....14. *C. dumetorum.*
  Calyx ascending or spreading, not at all gibbous; odd nutlet rather smooth.
    Nutlets triangular-ovate, 0.7–0.9 mm. long; mature calyx subglobose, minute, with lobes scarcely surpassing the nutlets.....15. *C. micromeres.*
    Nutlets oblong-lanceolate, 1–2 mm. long; mature calyx oblong, medium-sized, with lobes surpassing the nutlets. 16. *C. maritima.*

12. **C. recurvata** Cov. Ascendingly branched rather slender herb 1–3 dm. high; root frequently dye-stained; stems usually strigose, rarely appressed-hispid; leaves remote, oblanceolate or linear-oblanceolate, 1–2(–3.2) mm. long, 2–4(–5) mm. broad, rounded or obtuse, appressed-hispid, densely and minutely pustulate; spikes naked, slender, loose, 2–10 cm. long, solitary or geminate; corolla inconspicuous, subtubular, ca. 2 mm. long, not exserted, lobes short; fruiting calyces slender, subdistichously biseriate, very asymmetrical, characteristically bent and recurved, 3–4 mm. long, tardily deciduous, sessile; mature calyx-lobes linear, midrib somewhat thickened and hirsute, rarely merely strigose, axial lobe longest thickest and most hirsute; ovules 2; nutlet 1, subpersistent, oblong-lanceolate, inwardly curved, brownish, dull, granulate-muriculate, next the axial calyx-lobe, edges obtusish; groove somewhat oblique, narrow or closed, opening into a small basal areola; gynobase slender, ca. $\frac{1}{2}$ length of

the matured nutlet, slightly exceeded by aborted one; style commonly much surpassed by nutlet.—Contr. U. S. Nat. Herb. iv. 165, t. 16 (1893).

Eastern Oregon to Utah and the Inyo Region of California.

Oregon: Alword Desert, 1600 m. alt., *Leiberg 2425* (G, UC). Nevada: in open sand along water-pipe, Candelaria, 1950 m. alt., *Shockley 260* (G); sandy soil, Palmetto Range, 1800–2100 m. alt., *Purpus 5856* (UC). Utah: sandy places, Grand River Canyon, 1230 m. alt., *Purpus 6488* (UC); Dugway, 1891, *Jones* (UC). California: Surprise Canyon, Panamint Mts., 800 m. alt., *Coville & Funston 713* (G, UC, isotypes); Silver Canyon in White Mts., east of Laws, *Heller 8221* (G, UC); Silver Canyon, 1913, *K. Brandegee* (G, UC); Fish Lake Valley, 1897, *Purpus*.

One of the most distinct and interesting species in the genus. It may be readily recognized by its biovulate fruit and spreading, recurved fruiting calyces.

13. **C. echinosepala** Macbr. Loosely branched herb 1–2 dm. high; stems usually reddish, strigose as well as somewhat hirsute; leaves 2–4.5 cm. long, 2–5 mm. wide, linear to linear-lanceolate, below pustulate and short villous-hirsute, above subglabrate or minutely strigose; spikes geminate or solitary, usually 2–5 cm. long, naked or rarely with a single bract; corolla inconspicuous, tube shorter than calyx, limb ca. 1 mm. broad; fruiting calyx ovate, 2–3 mm. long, sessile or subsessile, spreading or even reflexed, asymmetrical; mature calyx-lobes very unequal, lance-linear, strigose and usually hirsute along the thickened midrib, axial lobe the longest and most hirsute; nutlets heteromorphous, usually 4, pallid, groove narrow and scarcely dilated below; odd nutlet minutely muriculate-tuberculate, ovate, acute, 1.2–1.5 mm. long, subpersistent, next the axial calyx-lobe, margin angulate; consimilar nutlets ca. 1 mm. long, minutely tuberculate, lance-ovate; gynobase evidently shorter than consimilar nutlets, oblong; style longer than consimilar nutlets, equalling or just surpassed by the odd nutlet.—Contr. Gray Herb. n. s. lvi. 57 (1918); Johnston, Proc. Calif. Acad. Sci. ser. 4, xii. 1147 (1924).

Southern Lower California.

Lower California: Santa Agueda, *Palmer 242* (G); Magdalena Bay, *Lung* (UC), *Bryant* (UC), *Brandegee* (UC); Magdalena Island, *Orcutt 15* (G, type); La Paz, *Palmer 26* (G).

At once distinguishable from nearly all other species of the genus by having its fruiting calyces deflexed and most heavily hirsute on the axial side. It is probably most related to *C. angustifolia*.

14. **C. dumetorum** Greene. Laxly branched closely strigose herb; stems at first erect but later commonly much elongated and sprawling

or scrambling among bushes; leaves lanceolate, thickish, 2–4 cm. long, 2–4(–8) mm. wide, sparsely appressed hirsute-villous, closely pustulate below and finely so above; spikes solitary or geminate, usually remotely flowered, 5–10 cm. long, occasionally with foliaceous bracts towards base, rhachis brittle and tortuously flattened; corolla inconspicuous, ca. 1 mm. broad; fruiting calyx closely appressed to rhachis, 2–3 mm. long, very asymmetrical, not at all deciduous, base very oblique and downwardly gibbous on axial side; mature calyx-lobes connivent and reaching about equal height; 3 abaxial lobes lanceolate, somewhat strigose, with the thickened midribs deflexed-hirsute; 2 axial lobes partly united, hirsute only on outer margins; nutlets 4, heteromorphous, granulate and muriculate; odd nutlet persistent, axil, broadly lanceolate, 2–3 mm. long, base much developed and distorting the calyx, groove open and broad; consimilar nutlets 1.5–2 mm. long, deciduous, lanceolate, groove closed or very narrow; gynobase narrow, shorter than consimilar nutlets; style shortly surpassed by nutlets or reaching to their tips.—Pittonia i. 112 (1887). *Krynitzkia dumetorum* Greene in Gray, Proc. Am. Acad. xx. 272 (1885).

Deserts from western Nevada to Southern California.

Nevada: Muddy Valley, 510 m. alt., *Kennedy & Goodding 74* (UC). Calif, ornia: half climbing among bushes at Tehachapi Pass, 1884, *Curran* (G-type); Kramer, *Parish 9810* (UC); Kramer, *K. Brandegee* (G, UC); Barstow, 1909, *K. Brandegee 158* (G, UC); Lancaster, *K. Brandegee* (UC); Whitewater, 300 m. alt., 1903, *Jones* (UC); without locality, *Lemmon* (UC).

An anomalous species very peculiar in habit and in calyx and nutlet developments. Although the tips of the 4 nutlets in each calyx are of equal height, their bases are decidedly not so. The base of the axial one is more developed than that of the others causing the axial side of the calyx to be gibbously distended downwards along the pedicel and thereby making the base of the calyx conspicuously oblique. In habit the species is unique in the genus. It commonly grows about bushes and scrambles up through them, often reaching a meter in height. So sinuous and brittle are the stems that it is commonly quite impossible to disentangle from the supporting bush a perfect specimen of this plant. The pedicels are unquestionably persistent, being as decidedly so as are those of *C. micrantha*. The type of the species is given as having come from Tehachapi Pass. An annotation in the University of California Herbarium gives the type-locality as: Tehachapi Pass, probably at the "Bend," between Mohave and Tehachapi Station.

15. **C. micromeres** (Gray) Greene. Slender usually erect-growing

herb 1–5 dm. tall; stems dull dark-green, short-hirsute throughout; leaves linear to oblong-linear, somewhat hirsute on both surfaces and usually somewhat pustulate beneath, 1.5–4.5 cm. long; spikes commonly ternate, very slender, naked, 2–8 cm. long; corolla inconspicuous, subtubular, ca. 0.5 mm. broad; fruiting calyces very small, 1–2 mm. long, subglobose, fulvous, sessile or nearly so, early deciduous; mature calyx-lobes ovate-lanceolate, decidedly connivent, scarcely surpassing the fruit, margins ciliate, midrib slightly thickened, hirsute and frequently uncinate; nutlets 4, heteromorphous, triangular-ovate, 0.7–0.9 mm. long, margin subangulate; odd nutlet slightly the largest, smooth or sparsely papillate, next the axial calyx-lobe; consimilar nutlets papillate, groove open, gradually dilated into a small open areola; gynobase equalled by consimilar nutlets but somewhat surpassed by odd one; style short, equalling or bearly surpassing the odd nutlet.—Pittonia i. 113 (1887). *Eritrichium micromeres* Gray, Proc. Am. Acad. xix. 90 (1883). *Krynitzkia micromeres* Gray, Proc. Am. Acad. xx. 274 (1885).

Central California to northwestern Lower California.

California: Ione, 1886, *K. Brandegee* (UC); near Mokelumne Hill, 1885, *Rattan 6* (G); Mokelumne Hill, *Blaisdell* (G); new Coulterville Road, Mariposa Co., 1897, *Congdon 42* (G); Tamalpais, 1910, *K. Brandegee* (UC); Antioch, 1889, *K. Brandegee* (UC); moist shaded ground, Cerritos Creek near Berkeley, *Tracy 761* (UC); Boswell's, Berkeley Hills, *Tracy 2074* (G); foothills west of Los Gatos, *Heller 7341* (G, UC); Glenwood, 1900, *Eastwood* (G); Ben Lomond, *K. Brandegee* (UC); Santa Cruz, *Jones* (G, TYPE); seaside, Monterey, *Eastwood 162* (G); on the Salinas road near Del Monte, *Heller 6698* (UC); Point Sur, 1888, *K. Brandegee* (UC); Painted Cave Ranch, Santa Barbara Co., *Eastwood 66* (G, UC); Santa Inez Mts., 1888, *Brandegee* (G); Santa Cruz Island, 1888, *Brandegee* (UC); chaparral burn, La Jolla, *Clements 109* (G, UC); Point Loma, *Brandegee 1622* (G, UC); Point Loma, *Eastwood 2518* (G); Point Loma, 1906, *K. Brandegee* (UC). Lower California: near Ensenada, 1882, *Jones* (UC).

This species develops the smallest flowering and fruiting parts known in the genus. Its occurrence is sporadic, and in the south at least somewhat determined by the presence of chaparral-burns.

16. **C. maritima** Greene. Ascending loosely branched herb becoming 1–3 dm. tall; stems commonly reddish, strigose or frequently hirsute; leaves linear to lanceolate, acutish, usually somewhat contracted at the base, 1–3.5 cm. long, 1–4 mm. wide, commonly hirsute, coarsely pustulate; spikes solitary or geminate, 1–6 cm. long, usually more or less crowded and frequently glomerate, irregularly leafy-bracted throughout; corolla inconspicuous, tubular, 1.4–2 mm. long, 0.5–1 mm. broad; fruiting calyx 1.8–3(–3.5) mm. long, ovate-oblong, stiffly ascending, slightly asymmetrical, tardily deciduous, subsessile;

mature calyx-lobes lance-linear, stiff, connivent, midrib of three abaxial lobes thickened and hirsute, margins appressed short hispid-villous or loosely villous; ovules 2 or 4; nutlets 1–4, heteromorphous; odd nutlet frequently alone developing, smooth, shiny, brownish, oblong-lanceolate, 1–2 mm. long, firmly affixed, next the axial calyx-lobe, groove narrow or closed throughout or opening below into a small areola; consimilar nutlets grayish, minutely tuberculate, readily deciduous, slightly smaller but otherwise like odd nutlet; gynobase subulate, ½–⅔ length of nutlet; style about equalling the height of consimilar nutlets.—Pittonia i. 117 (1887).

Var. **genuina.** Ovules 2; nutlets 1 or 2; calyx not conspicuously pilose.—*Krynitzkia maritima* Greene, Bull. Calif. Acad. Sci. i. 204 (Aug. 1885). *C. maritima* Greene, Pittonia l. c.; Munz & Johnston, Bull. Torr. Bot. Cl. xlix. 38 (1922). *K. ramosissima* of Greene, Bull. Calif. Acad. Sci. i. 203 (Aug. 1885); not *K. ramosissima* Gray (Jan. 1885). *C. ramosissima* of most recent authors.

Nevada to Lower California.

California: Mohave Desert, 1884, *Curran* (G); dry sand hills near Barstow, 700 m. alt., *Spencer 1950* (G); Maillard Canyon near Barstow, 700 m. alt., *Spencer 2088* (G); gravelly hillsides 17.6 km. west of Needles, 210 m. alt., *Munz & Harwood 3611* (UC); Needles, *Jones 3824* (G); desert sand, mouth of Tahquitz Canyon, 180 m. alt., *Spencer 1523* (G); sandy places near Palm Springs, 120 m. alt., *Spencer 1528, 2067, 2068* and *2071a* (G); rocks near Indian Wells, 8 m. alt., *Spencer 1520* (G); sandy places, Schaffer's Canyon near Mecca, 48 m. below sea-level, *Spencer 2069* (G) and *Munz & Keck 4755* (G); Signal Mt., *Abrams 3177* (G); Mason's, Colorado Desert, 1899, *Brandegee* (UC); in sand, Colorado Desert, *Spencer 195a* and *198* (G); Colorado Desert, 1890, *Wright* (UC); Point Loma, 1884, *Orcutt* (G, UC); windswept arroyos, San Nicolas Island, *Trask 56* and *57* (G); Santa Barbara Island, *Trask* (UC); Catalina Island, 1884, *Lyon* (G); Catalina Island, 1890, *Brandegee* (UC). Lower California: northern Lower California, *Orcutt 2257* (UC); Lagoon Head, *Palmer 781* (G, UC); Guadalupe Island, *Palmer 879* (G), *Anthony 241* (G, UC), *Palmer 67* (G), *Greene* in 1885 (G, UC, isotypes of *K. maritima*), *Anthony* in 1896 (UC), *Brandegee* in 1897 (UC); San Benito Island, *Palmer 912* (G), *Pond 21* (G), *Anthony 276* (UC), *Brandegee* in 1897 (UC); Natividad Island, 1897, *Brandegee* (UC); Santa Margarita Island, 1889, *Brandegee* (UC).

Var. **cedrosensis** (Greene), comb. nov. Ovules 4; nutlets 1–4; otherwise as in preceeding variety.—*Krynitzkia cedrosensis* Greene, Bull. Calif. Acad. Sci. i. 204 (1885). *C. cedrosensis* Greene Pittonia i. 117 (1887); Brandg. Bot. Gaz. xxvii. 454 (1899).

Endemic to Cedros Island.

Lower California: Cedros Island, *Palmer 691* (G). *Greene* in 1885 (G, UC, isotypes), *Veatch* (G), *Anthony 289* (G, UC).

Var. **pilosa** Johnston. Ovules 2; nutlets 1 or 2; calyx conspicu-

ously clothed with long white villous pubescence.—Univ. Calif. Pub. Bot. vii. 445 (1922).

Nevada to Lower California, occurring with var. *genuina* but less common.

NEVADA: Logan, 1909, *Kennedy* (UC). CALIFORNIA: Death Valley, *Coville & Funston 480* (G); Furnace Creek, *Parish 10005* and *10050* (UC); Calico, *Parish 9798* (UC); Inyo County, *Rixford* (UC); Kane Springs, Ord Mts., *Hall & Chandler 6807* (UC); Needles, 1884, *Lemmon* (UC); Signal Mt., 1901, *Brandegee* (UC). ARIZONA: Tempe, 1892, *Ganong & Blaschka* (G). LOWER CALIFORNIA: stony ridges, Los Angeles Bay, *Palmer 551* (UC, TYPE; G, ISOTYPE); Santa Agueda, *Palmer 2142* (UC).

A well defined and common species in the Californian deserts and on the coastal islands. The usual form is readily recognized by being biovulate and having reddish strigose stems. It has generally gone as *C. ramosissima* but that name being based on a renaming of *C. racemosa* properly falls into synonymy.

Ser. V. PTEROCARYAE. Nutlets 1–4, tuberculate or papillate or verrucose, lanceolate, with knife-like or conspicuously winged sides, homomorphous or frequently heteromorphous and with the odd nutlet (sometimes alone developing) axial and usually lacking a thin margin; style reaching to tip of nutlet-body or definitely beyond.

Nutlets solitary or rarely 2, usually with a knife-like margin; calyx obliquely conical at base.....17. *C. utahensis.*
Nutlets 4; calyx symmetrical.
  Corolla conspicuous; mature calyx obviously longer than broad; nutlets always homomorphous.....18. *C. oxygona.*
  Corolla inconspicuous; mature calyx nearly as broad as long; axial nutlet frequently wingless.....19. *C. pterocarya.*

17. **C. utahensis** (Gray) Greene. Erectly branched herb 1–3 dm. high; stems closely strigose or more or less appressed short-hirsute; leaves not numerous, strongly reduced above, linear to oblance-linear, 1-5(–7) cm long, 1–4 mm. wide, rounded at apex, commonly pustulate and short-hirsute especially beneath; spikes geminate or sometimes solitary, commonly 0.8–2.5(–5) cm. long, dense, naked; corolla evident, 2–3 mm. broad; fruiting calyces ovate or ovate-oblong, 2–3(–4) mm. long, quite asymmetrical, subsessile by a broadly conic oblique base, spreading or somewhat recurved, deciduous, usually densely appressed-hirsute and notably silky; mature calyx-lobes lanceolate, strongly connivent, midrib thick and usually brownish and infrequently bearing spreading or recurved hairs; ovules 4; nutlets 1 or rarely 2, next the abaxial calyx-lobe, 1.7–2.5 mm. long, 1–1.5 mm. broad, pale, broadly lanceolate, granulate, muricate-

papillate or rarely spinulose, back low-convex or flat, margins sharp-angled or with a very narrow knife-like margin; groove open, narrow, opening into a small areola below; gynobase subulate, ca. ⅔ height of nutlet, not markedly differentiated from style; style usually a trifle shorter than the nutlet.—Pittonia i. 120 (1887). *Krynitzkia utahensis* Gray, Synop. Fl. N. Am. ii. pt. 1, Suppl. 427 (1886). *Eritrichium holopterum*, var. *submolle* Gray, Proc. Am. Acad. xiii. 374 (1878). *C. submollis* Cov. Contr. U. S. Nat. Herb. iv. 166 (1893).

Southern Utah and western Arizona and westward into the deserts of California.

UTAH: volcanic rocks and ashes, Diamond Valley, *Goodding 828* (G, UC); St. George, *Palmer 352* (G, TYPE). ARIZONA: Yucca, *Jones* (G); Yucca, *Jones 3910* (UC). NEVADA: Candelaria, *Shockley 347* (G) and *650* (UC); foot of cliffs, Meadow Valley Wash, *Goodding 2165* in pt. (G); rocky slopes, Mesquite Well, *Goodding 2252* (G); Rhyolite, 1080 m. alt., *Shockley 69* (UC); Gold Mt., *Purpus 5986* (UC). CALIFORNIA: Inyo County, 1891, *Brandegee* (UC); Surprise Canyon, Panamint Mts., 800 m. alt., *Coville & Funston 714* (G); without locality, *Purpus 5433* (G); Providence Mts., *Munz, Johnston & Harwood 4241* (UC); Daggett, 1914, *K. Brandegee* (UC); sandy places near Barstow, *Spencer 2082* and *2093* (G); in sandy places, Palm Springs, *Spencer 1526, 2073, 2074, 2075* and *2076* (G); in sandy places, Mission Canyon, 180 m. alt., *Spencer 1782* (G); Colorado Desert, 1889, *Orcutt* (UC).

A very neat species most readily distinguished by the appressed silky indument on the calyx. It seems to be an ally of *C. pterocarya*. Its rough nutlets at once distinguish it from *C. gracilis* and *C. Watsoni* with which it has been frequently confused.

18. **C. oxygona** (Gray) Greene. Sparsely branched herb 1–4 dm. tall; stems usually solitary with several well-developed ascending branches from near base, appressed villous-hispid or strigose, often sparsely hispid, leaves linear or lance-linear, 1–4(–6) cm. long, 1–2(–3) mm. broad, strigose or short-hispid, ascending, obtusish, densely and inconspicuously pustulate, upper ones evidently reduced; spikes geminate or ternate, usually short and dense, 1–3(–6) cm. long, naked; corolla conspicuous, limb 4–7 mm. broad; fruiting calyces ovate or oblong-ovate, ascending, 2.5–4 mm. long, deciduous, obscurely biserial, symmetrical, base rounded, pedicel ca. 0.5 mm. long; mature calyx-lobes lanceolate, somewhat connivent above, margin more or less silky-strigose, midrib slightly thickened and frequently sparsely hirsute; nutlets 4, homomorphous; body of nutlets oblong-ovate, 2 or rarely 3 mm. long, only slightly shorter than the calyx-lobes, muricate or tuberculate, back low convex; margin of nutlet narrowly winged or knife-like; groove closed or rarely open, broadly forked below where always opened to form a triangular areola; gynobase columnar-

subulate, about ⅔ height of nutlets; style clearly surpassing the nutlets.—Pittonia i. 120 (1887). *Eritrichium oxygonum* Gray, Proc. Am. Acad. xix. 89 (1883). *Krynitzkia oxygona* Gray, Proc. Am. Acad. xx. 277 (1885).

Borders of the San Joaquin Valley and southward along the desert margins to the northern end of the Colorado Desert.

California: Alcalde, 1892, *Brandegee* (UC); Estrella, 1897, *Jared* (UC); open places in rich ground, McKittrick, *Heller 7789* (G, UC); northern slope of Tehachapi, 1905, *K. Brandegee* (UC); Tehachapi, *K. Brandegee* (G, UC); hills bordering the Mohave Desert, 1882, *Pringle* (G, TYPE); mountain slopes, San Bernardino Co., 1200 m. alt., *Spencer 415* (G); without locality, *McLean* (UC); near Minerets, Madera Co., 1899. *Congdon* (UC); hillsides, Erskin Creek, *Purpus 5369* (G, UC); Deep Spring, *Purpus 5825a* (UC); Coyote Canyon, 150 m. alt., *Hall 2849* (UC); between San Jacinto and El Toro Mts. at Van Deventer Ranch, 1350 m. alt., *Hall 1161* (UC). Nevada: Palmetto Range, *Purpus 5897* in part (UC).

This species, although having the gross habit of *C. muricata*, is clearly related to *C. pterocarya* and particularly to the variety *cycloptera*. In fact, decisive characters for separating the two species appear to be lacking. As a general rule, however, *C. oxygona* differs in having conspicuous corollas, narrower usually more silky calyces, and brownish nutlets rarely if ever with scolloped or lobed wings. It is maintained as a species largely because of its natural range, which, generally speaking, is apart from that of *C. pterocarya*. The most satisfactory character for separating *C. oxygona* from *C. pterocarya* seems to be corolla-size. It is significant, however, that a specimen (*Purpus 5715a*) from the South Fork of the Kern River, occurring within the range of *C. oxygona* and having the characteristic habit, calyx and nutlets of that species, nevertheless has minute corollas. For practical purposes this specimen has been refered to *C. pterocarya*.

19. **C. pterocarya** (Torr.) Greene. Erect ascendingly branched herb 1–5 dm. high, finely strigose or short-hirsute; leaves broadly linear or the reduced, upper ones somewhat lanceolate, 1–2.5(–4) cm. long, 1–3(–5) mm. broad, obtuse, strigose or hispid, coarsely pustulate below but usually finely so above, spikes geminate or rarely ternate or solitary, naked or inconspicuously bracted below, 2–6(–12) cm. long, becoming loosely flowered; corolla inconspicuous, 0.5–1(–2) mm. broad; fruiting calyces becoming notably accrescent, usually broadly ovate, (2–)3–5 mm. long and usually about ¾ as broad, tardily deciduous, symmetrical, base obtuse or rounded, pedicels 0.5–1 mm. long; mature calyx-lobes ovate to lanceolate, connivent, only a little surpassing the nutlets, margins more or less tawny appressed-hispid, midrib slightly thickened and weakly and sparsely hispid; nutlets 4,

homomorphous and all winged, or heteromorphous with axial nutlet wingless; body of nutlet oblong-lanceolate or lanceolate, 2–2.5(–3) mm. long, muricate or verrucose; wing-margin of nutlet broad or narrow, entire or crenate or lobed, extending completely around the nutlet or only down the sides; groove open or closed (even in the same plant) and dilated below into an open excavated areola; gynobase slender, about ⅔ height of nutlets; style subulate, slightly surpassing or somewhat surpassed by the wing-margin of the nutlets but always exceeding the body proper.—Pittonia i. 120 (1887).

Var. **genuina.** Nutlets heteromorphous, axial one wingless.—*Eritrichium pterocaryum* Torr. Bot. Mex. Bound. 142 (1859); Bot. Wilkes Exped. 415, t. 13 (1873). *Krynitzkia pterocarya* Gray, Proc. Am. Acad. xx. 276 (1885). *C. pterocarya* Greene, l. c. *E. pterocaryum*, var. *pectinatum* Gray, Proc. Am. Acad. x. 61 (1874). *K. pterocarya*, var. *pectinata* Gray, Proc. Am. Acad. xx. 276 (1885). *C. pectocarya* Frye & Rigg, Northwest Fl. 328 (1912).

Eastern Washington and southern Idaho and southward to Southern California and Utah. Sporadic in Arizona.

WASHINGTON: junction of Crab and Wilson creeks, *Sandberg & Leiberg 260* (G, UC); in sand, Pasco, *Piper 2961* (G); Walla Walla, *Brandegee 995* (G, UC) and *994* (UC); rocky bank of Columbia River near Columbus, *Suksdorf 889* (UC); without locality, *Vasey 421* (G). OREGON: clay bank, Mathew Butte, 750 m. alt., *Leiberg 2041* (G, UC); near Lexington, 400 m. alt., *Leiberg 41* (G, UC). IDAHO: dry open slope, Castleford, *Nelson & Macbride 1739* (G). UTAH: St. George, 1880, *Jones* (UC); southern Utah, 1873, *Bishop* (G); Stansbury Island, *Watson 859* (G). NEVADA: Peavine Hills, 1895, *Hillman* (UC); Pyramid Lake, *Kennedy 998* (UC); Truckee Lake, *Kennedy 1345* (UC); Lawton's Springs, 1894, *Hillman* (UC); Reno, 1890, *Hillman* (UC); Reno, 1884, *Curran* (UC); Reno, 1885, *K. Brandegee* (UC); about Carson City, 1446 m. alt., *Baker 975* (G, UC); Carson City, *Watson 859* (G); Carson City, *Anderson 165* (G); Candelaria, *Shockley 282* (UC); ravine among hills near Mina, *Heller 8365* (G); on scoria on mesa west of Goldfield, *Heller 10971* (G); Gold Mt., *Purpus 5986* (UC); boulder slopes, Moapa, *Goodding 2202* (G, UC); Indian Spring, Clarke Co., 1020 m. alt., *Tidestrom 9026* (G); foot of cliff, Meadow Valley, *Goodding 2165* in pt. (G); stony hillsides, Meadow Valley Wash, *Goodding 974* (G). ARIZONA: near Needles, 1886, *Clark* (UC); Yucca, *Jones 3906* (UC); near Camp Lowell, *Pringle 366* in pt. (G). CALIFORNIA: Honey Lake, 1892, *Brandegee* (UC); Sierra County, *Lemmon* (G); foothills west of Bishop, *Heller 8275* (G); Andrews Camp, Bishop Creek, *Davidson 2698* (G); Andrews Camp near Bishop, *K. Brandegee* (UC); McGee's Meadow near Bishop, *K. Brandegee* (UC); sandhills west of Laws, *Heller 8205* (G); sand, Kramer, *Heller 7668* (G, UC); Keeler, 1891, *Brandegee* (UC); Barnwell, *K. Brandegee* (UC); Leastalk, *Parish 10238* (UC); Granite Wells, *Parish 10138* (UC) and *Johnston 6494* (UC); sand near Barstow, *Spencer 2084* (G); Ord Mts., *Hall & Chandler 6803* (UC); Acton, *Elmer 3716* (G); Descanso, *K. Brandegee* (G, UC).

Var. **cycloptera** (Greene) Macbr. Nutlets homomorphous, all winged.—Contr. Gray Herb. n. s. xlviii. 44 (1916). *Krynitzkia*

cycloptera Greene, Bull. Calif. Acad. Sci. i. 207 (1884). *C. cycloptera* Greene, Pittonia i. 120 (1887).

Southern California to western Texas and sporadic in southern Nevada and Utah and in eastern Colorado.

California: Inyo, 1891, *Brandegee* (UC); Surprise Canyon, Panamint Mts., 800 m. alt., *Coville & Funston 720* (G); Ord Mts., *Hall & Chandler 6807a* (UC); rocky places, Snow Creek near Palm Springs, 150 m. alt., *Spencer 2065a* (G); desert sand, Palm Springs, 135 m. alt., *Spencer 846* and *847* (G); rocky places, Cathedral Canyon near Palm Springs, 120 m. alt., *Spencer 2079* (G); Coyote Canyon, 150 m. alt., *Hall 2839* (UC); desert sand, Mountain Springs, *Spencer 200* and *856* (G); San Felipe, 1895, *Brandegee* (UC); Colorado Desert, 1896, *Brandegee* (UC); Colorado Desert, *Wright 1764* and *1770* (UC); Colorado Desert, *Spencer 190* (G). Nevada: sandy places, Charleston Mts., *Purpus 5825* (UC); shade of rocks, Muddy Range, *Goodding 2227* (G); Muddy Valley, *Kennedy & Goodding 24* (UC). Arizona: Diamond Creek Canyon, 1893, *Wilson* (UC); northern Arizona, 1893, *Wilson* (UC); Verde River, *Smart 132* (G); hills near Tucson, 1884, *Pringle* (G, isotype); Tucson, 1894, *Toumey* (UC); Rio Cienega, *Greene 1111* (G); Nogales, 1892, *Brandegee* (UC); Lowell, *Parish 167* (G); Fort Whipple, *Palmer 346* (G). Colorado: Grand Junction, 1892, *Eastwood* (G). New Mexico: rocky hillsides, south end of Black Range, 1380 m. alt., *Metcalfe 1573* (G). Texas: El Paso, *Jones 3753* (UC); Fronteras, *Wright 1570* (G).

This is one of the most interesting species in the genus. Its conspicuously winged nutlets and broad large fruiting calyces are very distinctive. Although for the most part readily determined, it has some forms that are very puzzling. The outstanding variation is the well understood one regarding nutlet-form. As a general rule, the northern material has heteromorphous nutlets, whereas the southern has them homomorphous. Actual intergrades connecting the two forms are rare. In these the axial nutlet is frequently smallest and is more narrowly and less completely winged than the others. The northern plant with heteromorphous nutlets has been commonly taken as the typical form. The specific name was first published in the Mexican Boundary Report. The few notes there given clearly apply to the southern homomorphous form. From internal evidence, however, it is very clear that the Mexican Boundary Report was written subsequently to the Botany of the Wilkes Expedition. Hence the much later publication in the Wilkes Report is primarily considered in typifying the species, especially since in that work the plant was illustrated and fully described. The material from Walla Walla, Washington, collected by Pickering & Brackenridge and illustrated by Torrey is accordingly taken as the type. This material has heteromorphous nutlets. The southern plant with homomorphous nutlets was named *C. cycloptera* by Greene and was subsequently reduced to a variety of *C. pterocarya* by Macbride. It is possible that the

varietal name *pectinata* should be taken up in place of var. *cycloptera*. Gray originally published it as *Eritrichium pterocaryum*, var. *pectinatum*, basing it upon material collected by Parry (numbers *168* and *169*) in the Virgin River Valley near St. George, Utah. Unfortunately, however, Gray hastily mounted collections by Greene and by Palmer on the type sheet of the var. *pectinatum* and it is now quite impossible to decide just which are the original Parry collections. Since both var. *genuina* and var. *cycloptera* are represented on the mixed sheet it seems best to drop the varietal name *pectinatum* as a *nomen confusum*, particularly so since the lobing of the nutlet-wing seems to be too hopelessly variable and unimportant to justify nomenclatorial recognition.

The most puzzling forms of *C. pterocarya* come from southern Nevada and Southern California. Purpus has collected material in the Gold Mountains of Nevada which have very small, scarcely accrescent calyces and a habit suggesting that of *C. utahensis* or *C. gracilis*. The nutlets, though small, are quite like those of typical *C. pterocarya* and it seems best to refer the specimens to that group.

A specimen collected by Munz (number *5746*) above Cactus Flats in the San Bernardino Mts. of California, although clearly related to *C. pterocarya*, may represent an unnamed species. The calyces are rather small and quite hirsute, although with the characteristic broad form of *C. pterocarya*. The nutlets are heteromorphous, but instead of having the odd nutlet wingless, it is winged and the consimilar nutlets are wingless and suggest those of *C. utahensis*. More material of this peculiar variation is greatly desired.

I doubtfully refer to the var. *cycloptera* a collection made by Purpus (number *5715a*) in the South Fork of the Kern River. The specimen has the habit of *C. holoptera*, in fact appears to differ from thoroughly typical members of that species only in having inconspicuous corollas. Since flower-size seems to be the only character capable of separating *C. holoptera* and *C. pterocarya* in a manner that is at all practical and satisfying, I am arbitrarily referring Purpus's collection to *C. pterocarya* although it is realized that in range and habit it unmistakably suggests *C. holoptera*.

Ser. VI. TEXANAE. Nutlets 1–4, tuberculate or papillate, ovate to lanceolate or oblong, with obtuse or rounded sides, decidedly heteromorphous with the odd nutlet (sometimes the only one developing) axial, larger than and usually roughened very differently from the others; style surpassed by odd nutlet.

Nutlets smooth or nearly so.....20. *C. Pattersoni.*
Nutlets coarsely granulate or tuberculate.
Nutlet 1, axial one alone developing; ascendingly branched, usually 2–4 dm. tall.....21. *C. texana.*
Nutlets 4; spreading, usually 1–1.5 dm. tall.
Consimilar nutlets lance-ovate, acuminate, 1.8–2.3 mm. long; areola small and suprabasal; calyx-lobes only moderately thickened.....22. *C. Kelseyana.*
Consimilar nutlets ovate or oblong, acute, ca. 1.5 mm. long; areola large and ventral; calyx-lobes conspicuously thickened, hard.
Spikes bracteate throughout; odd nutlet papillate-granulate.....23. *C. minima.*
Spikes naked; odd nutlet finely granulate and spinular-muricate.....24. *C. crassisepala.*

20. **C. Pattersoni** (Gray) Greene. Loosely branched hirsute herb 1–1.5 dm. high; stems usually several, ascending, branched, hirsute and usually somewhat strigose; leaves oblanceolate 1–3 cm. long, 2–4 mm. wide, rather firm, obtuse, hirsute, more or less pustulate, upper ones little reduced; spikes solitary or geminate, naked, 2–5(–7) cm. long; corolla inconspicuous, 1–1.5 mm. broad; fruiting calyx oblong-ovate, 4–5 mm. long, spreading, slightly asymmetrical, evidently biserial, lowermost becoming 2–6 mm. distant; pedicels ca. 0.5 mm. long; mature calyx-lobes linear-lanceolate, tips more or less connivent, midrib thickened and hirsute, margins appressed hispid; nutlets 4, heteromorphous; odd nutlet next axial calyx-lobe, slightly the largest, ca. 1.9 mm. long, ovate, acute, smooth or obscurely rugulose or sparsely tuberculate, somewhat persistent, standing off slightly from the gynobase; consimilar nutlets oblong-ovate, ca. 1.6 mm. long, deciduous, closely appressed to gynobase, smooth, back convex, sides rounded or obtuse, groove opened or closed and abruptly broadening below into a small triangular areola; gynobase narrow, reaching to ca. ⅔ height of consimilar nutlets; style exceeded by odd nutlet, equalling or a little shorter than consimilar nutlets.—Pittonia i. 120 (1887). *Krynitzkia Pattersoni* Gray, Proc. Am. Acad. xx. 268 (1885).

Mountains of Colorado and Wyoming. Rarely collected.

Wyoming: very dry sandy soil, 32 km. east of Point of Rocks, *Payson 2546* (G); on dry roadsides, Junction Butte, *Nelson 5887* (G). Colorado: Kremling, *Osterhout 3464* (G); Sulphur Springs, *Osterhout 3559b* (G.); without locality, 1875, *Patterson* (G, type); without locality, 1877, *Hooker & Gray.*

This species is related to *C. Kelseyana* and *C. ambigua* and seems to intergrade with both. In habit it is quite like *C. ambigua*, and with immature material alone available it is scarcely possible to distinguish

it from that species. The most troublesome intergrades come from northwestern Wyoming. Certain material from this region has the nutlet next the axillary calyx-lobe slightly more persistent and more erect than the others, and hence suggesting a relationship with *C. Pattersoni*. Despite these suggestive developments the specimens are referred to *C. ambigua*, since for all practical purposes the nutlets are similar in size and shape, and usually indistinguishable in markings and hence quite like those of *C. ambigua*.

The type of *C. Pattersoni* probably came from the Rocky Mountains near Golden, Colorado. The species appears to occur at altitudes somewhat higher than those affected by *C. Kelseyana* and *C. minima*.

21. **C. texana** (A. DC.) Greene. Ascendingly branched hirsute herb 1.5–4 dm. high; stems usually several, with few short branches; leaves oblanceolate 2–5(-7) cm. long, 2–5(–8) mm. wide, obtuse or rounded, not particularly firm, uppermost little reduced; spikes solitary or occasionally geminate or ternate, naked or at times sparsely bracted at base, 4–7(–11) cm. long, not sharply differentiated from leafy mass of plant; corolla inconspicuous, ca. 1 mm. broad; fruiting calyces ovate-oblong, 4–5 mm. long, somewhat asymmetrical, widely spreading or subdeflexed, becoming remote; pedicels short but evident, 0.5–1 mm. long; mature calyx-lobes lance-linear, more or less connivent with the herbaceous tips spreading, midrib indurated and strongly hirsute, margin sparsely short-hispid; ovules 4, only the one next the axial calyx-lobe maturing; nutlet solitary, persistent, broadly ovate, acute, ca. 2 mm. long, pale, densely and evenly coarse-granulate, back convex, sides rounded; gynobase short-oblong, $\frac{1}{3}$–$\frac{1}{4}$ as long as the style; style reaching to above the middle of the nutlet.—Pittonia i. 112 (1887). *Eritrichium texanum* A. DC. Prodr. x. 130 (1846). *Myosotis texanae* Hook. Kew Jour. Bot. iii. 295 (1851). *Krynitzkia texana* Gray, Proc. Am. Acad. xx. 268 (1885).

Central and western Texas.

Texas: Llano County, 1885, *Reverchon* (G); dry ground. Austin, *Hall 469* (G); valleys among hills beyond Limpia Pass, *Wright 488* (G); without locality, *Drummond* (G, UC, isotypes); without locality, *Wright* (G).

Evidently related to *C. crassisepala* but quite distinct, since it differs in its more restricted easterly range, looser and taller habit of growth, and coarsely granulate solitary nutlets. Although *C. texana* has four ovules only one nutlet develops, that being the one next the axial calyx-lobe and clearly the homologue of the odd nutlet in *C. crassisepala*. The type of *C. texana* was collected by Drummond probably in the vicinity of Austin.

22. **C. Kelseyana** Greene. Spreading or ascending hirsute herb 5–25 cm. high; stems one to several, hirsute and also hispid-strigose; leaves 1.5–3(–4) cm. long, 2–4 mm. wide, rounded or obtuse, thickish, linear-oblanceolate, hirsute, pustulate, the upper ones scarcely reduced; spikes usually solitary, 4–9 cm. long, naked or with a few bracts near base; corolla inconspicuous, 1–2 mm. broad; fruiting calyx 4–6 mm. long, ovate-oblong, spreading, somewhat asymmetrical, loose or dense; pedicels short but definite, ca. 0.8 mm. long; mature calyx-lobes linear, slightly connivent above, midrib thickened and hirsute, margins inconspicuously villous-strigose; nutlets 4, heteromorphous; odd nutlet next the axillary calyx-lobe, broadly lance-ovate, 2–2.6 mm. long, smoothish or granulate or granulate-muriculate or rarely somewhat tuberculate, standing off slightly from the gynobase; consimilar nutlets lance- or oblong-ovate, 1.8–2.3 mm. long, coarsely tuberculate and commonly granulate, darker than odd nutlet, sides rounded; groove narrow or closed, near base abruptly dilated to form a small triangular areola; gynobase subulate, a little longer than style, ½–⅔ height of consimilar nutlets; style surpassed by odd nutlet and just surpassing or even exceeded by consimilar ones.—Pittonia ii. 232 (1892); Macbr. Contr. Gray Herb. n. s. xlviii. 49 (1916).

Saskatchewan and Montana southward through Wyoming to northern Colorado and Utah.

Saskatchewan: Medicine Hat, *Macoun 5803* in pt. (G); without locality, 1858, *Bourgeau* (G). Montana: scratch gravel near Helena, 1898, *Brandegee 26* (UC); Boulder Desert, 1898, *Brandegee 36* (UC); Elliston, Aug. 1889, *Greene* (G. isotype); Northern Boundary, French Creek to Rocky Mts., 1874, *Coues* (G). Wyoming: Teton National Forest, 1897, *Brandegee* (UC); snow-drift beds, Powder River, *Nelson 9377a* and *9415* (G); C. Y. Horse Ranch, Natroma Co., *Goodding 234* (G); open woods near the river, Ft. Steele, *Nelson 9049* (G); waste ground, Bates Creek, *Goodding 197* (G); sandy plains, Laramie, *Nelson 3171* and *7280* (G, UC); under ledges, Cow Creek, *Nelson 8897* (G, UC); Pole Creek, *Nelson 1335* (G, UC); Laramie Hills, *Nelson 412* (G); Sherman, 1893, *Greene* (UC); Gorfield Peak, *Nelson 672* in pt. (UC); sandy roadside 5 km. north of Saratoga, *Payson 2535* (G). Utah: deep sand, Ogden, *Goodding 1176* (G). Colorado: Kremling, *Osterhout 3464* (G); mountain side near Georgetown, 1885, *Patterson* (G, UC); Castle Rock in foothills near Golden, *Patterson 111* (G); west of Craig, *Osterhout 6188* (G); Rocky Mts., lat. 40°–41°, *Vasey 434* (G).

This plant has been often confused with *C. crassisepala* although quite distinct in range and in structures. It is a larger more loosely branched plant with more elongate less indurated calyx-lobes, narrower ventrally less excavated nutlets, and a range separated from true *C. crassisepala* by half the width of Colorado and Utah. Although frequently growing with *C. minima* it is at once separable by its ebracteate inflorescence and very different nutlets.

23. **C. minima** Rydb. Erect or widely spreading hirsute herb 1–1.5(–2) dm. high; stems usually numerous, branched, finely strigose and coarsely hirsute; leaves oblanceolate, thickish, 1–3 cm. long, 2–4 (–5) mm. broad, obtuse or rounded, hispid or hirsute and usually pustulate, upper ones little reduced and continuing through inflorescence as evident foliaceous bracts; spikes solitary or rarely geminate, bracted, 2–8(–15) cm. long, frequently springing from even the lowest axils; corolla inconspicuous, 1–1.5 mm. broad; fruiting calyces oblong-ovate, 5–7(–9) mm. long, spreading, asymmetrical; pedicels short but definite, 0.5–1.2 mm. long; mature calyx-lobes linear-lanceolate, connivent above, midrib hirsute and strongly indurated and thickened, margins sparsely appressed-hispid; nutlets 4, heteromorphous; odd nutlet persistent, next the axial calyx-lobe, 2–3 mm. long, brownish, very finely and closely papillate-granulate, ovate, acute; consimilar nutlets 1.2–1.5 mm. long, ovate, thickish, strongly tuberculate, not granulate; groove broadly dilated at least to beyond middle, commonly excavated, not forked; gynobase oblong, slightly more than ½ length of consimilar nutlets; style evidently surpassed by odd nutlet, equalling or surpassing consimilar nutlets.—Bull. Torr. Bot. Cl. xxviii. 31 (1901).

Plains east of continental divide from Saskatchewan southward to northern Texas; occuring west of the mountains only in southwestern Colorado.

Saskatchawan: Medicine Hat, *Macoun 5803* in pt. (G). Montana: Great Falls, 1887, *Anderson* (UC). Wyoming: Blue Grass Hills, *Nelson 304* (G, UC). Colorado: Castle Rock near Golden, 1800 m. alt., *Patterson 111* in pt. (G); near Golden, *Greene 301* (G); Ft. Collins, 1896, *Crandall* (UC); lat. 39°–41°, *Hall & Harbour 433* and *434* (G); 10 km. north of Pueblo. *Johnston & Hedgcock 509* (G); Canyon City, *Brandegee 406* (G, UC); Cuchara River, above La Veta, 2100 m. alt., *Rydberg & Vreeland 5697* (NY, type); dry adobe flats and foothills, Paradox, 1620 m. alt., *Walker 155* (G); dry hillsides, Naturita, 1620 m. alt., *Payson 296* (G); without locality, 1842. *Fremont* (G). South Dakota: Bad Lands, 1881, *Hatcher* (UC). Nebraska: Kennedy, 1890, *Bates* (G); Callaway, 1901, *Bates* (G); Harrison, 1890, *Bates* (G); top of butte, Ft. Robinson, 1200 m. alt., *Bessey 1* (G). Kansas: Ellis, 1876, *Watson* (G); plains, Ellis, *Hitchcock 346* (G). Oklahoma: low waste place, Waynoka, *Stevens 598* (G); sandy waste places, Alva, *Stevens 245, 616, 664* and *3040* (G); waste place, Shattuck, *Clifton 3083* and *3139* (G); waste place, Hornbeck's, *Stevens 282* (G). Texas: sandy plains, upper Colorado, *Reverchon 2120* (G); Big Wichita, 1880, *Ball* (G).

Although a very readily recognized species, *C. minima* has not been distinguished from its southerly ranging relative, *C. crassisepala*. *Cryptantha minima* has thick, hardened calyx-lobes and a gross habit very similar to that possessed by *C. crassisepala*, but differs very sharply in having definitely bracted inflorescences and in the fact that

the odd nutlet is simply papillate-granulate rather than covered with spiculate murications. The ranges of *C. minima* and *C. crassisepala* overlap only in southwestern Colorado. In the northern part of its range *C. minima* grows with *C. Kelseyana*, and, strange to say, has been frequently confused with it, although *C. minima* can at once be separated by its stockier nutlets with larger areolae, and, of course, by its bracteate inflorescence.

The name *C. minima* was originally proposed to cover certain material thought to be related to *C. pusilla*. An examination of the type, however, shows clearly that it is a very reduced form of the species here treated, and that though inappropriate, it is the name to be taken up for the bracteate material from the Great Plains until now passing as *C. crassisepala*.

24. **C. crassisepala** (T. & G.) Greene. Erect or widely spreading herb 5–15 cm. high; stems commonly numerous, loosely ascending, branched, hirsute or rarely hispid; leaves oblanceolate, 2–3(–6) cm. long, 3–4(–6) mm. wide, rounded or obtuse, thickish, hirsute, pustulate, the upper scarcely reduced; spikes solitary or rarely geminate, naked or few-bracted below, 5–8(–15) cm. long, frequently produced from the lowest axils; corolla inconspicuous, 1–1.5 mm. wide; fruiting calyces 6–7(–10) mm. long, oblong-ovate, somewhat asymmetrical, becoming distant below; mature calyx-lobes linear-lanceolate, connivent above, midrib very hirsute and strongly thickened and indurated, margins inconspicuously short-hispid; pedicels short but definite, 0.5–1.2 mm. long; nutlets 4 (1 or 2 rarely aborted), decidedly heteromorphous; odd nutlet next the axial calyx-lobe, persistent, 2–2.5(–3) mm. long, brownish, ovate, acute, finely granulate and spinular-muricate; consimilar nutlets readily deciduous, 1.2–1.5(–2) mm. long, oblong-ovate, thickish, coarsely tuberculate, very obscurely if at all granulate, groove usually dilated and commonly excavated to form an areola occupying much of the ventral face of the nutlet; gynobase narrowly oblong, usually about ⅔ height of consimilar nutlets; style equalling or a trifle exceeding the consimilar nutlets, surpassed by odd nutlet.—Pittonia i. 112 (1887). *Eritrichium crassisepalum* T. & G. Pacif. R. R. Rep. ii. pt. 4, 171 (1855). *Krynitzkia crassisepala* Gray, Proc. Am. Acad. xx. 268 (1885). *C. dicarpa* Nels, Proc. Biol. Soc. Wash. xvi. 30 (1903).

Southwestern Colorado and southern Utah southward to western Texas, Arizona and adjacent Mexico.

Colorado: Deer Run, Gunnison Watershed, 1380 m. alt., *Baker 75* (G); Grand Junction, 1892, *Eastwood* (G, UC); dry sandy flat, Grand Junction,

Macbride & Payson 689 (G). UTAH: Cisco, 1890, *Jones* (G, UC); Price, 1895, *Stokes* (UC); Green River, 1890, *Jones* (UC). NEW MEXICO: Ft. Wingah, *Mathews 40* (G); Gila River bottom near Cliff, 1350 m. alt., *Metcalfe 52* (G, UC); Santa Fe, *Fendler 640* (G); Hueco Mts., *Thurber 61* (G); Albuquerque, *Jones 3709* (UC); mesa west of Organ Mts., 1200 m. alt., 1905, *Wooton* (G. UC); Silver City, *Eastwood 8401* (G). ARIZONA: Camp Lowell, 1883, *Pringle* (UC); Chino Valley, *Tuomey 240a* (UC); Clifton, *Davidson 501a* (UC); Aztec Ruins, Little Colorado, 1905, *Purpus* (UC); Verde Mesa, *Smart 141* (G); Douglas, 1200 m. alt., *Goodding 2273* (G, UC); Tucson, 1907, *Loyd* (G); Bernardino, 1902, *Orcutt* (UC); without locality, 1882, *Pringle* (UC). TEXAS: vicinity of permanent camp on Rio Pecos, April 6–7, 1856, *Pope Exped.* (G, ISOTYPE?); abundant on sandy hills northeast of El Paso, *Hanson 402* (G, NY); western Texas, March 9th, *Wright* (G). CHIHUAHUA: sandy soil, Juarez, 1905, *Purpus* (UC); San Diego, 1800 m. alt., *Hartman 612* (G, UC).

Cryptantha crassisepala is a very interesting and readily recognized species most related to *C. minima*. Although it usually produces four nutlets some forms of it regularly mature only two or three. It is one of these forms, indistinguishable in other respects, that was made the type of *C. dicarpa*. The consimilar nutlets of *C. crassisepala* and *C. minima* are rather thick for their breadth. In this respect, as well as in general contour, they strikingly simulate the nutlets of *C. albida*, a species not closely related. The only material suggestive of a condition intermediate between *C. minima* and *C. crassisepala* is Eastwood's collection from Grand Junction. In that collection nutlets typical of *C. minima* are associated with the naked inflorescence and habit of *C. crassisepala*.

Ser. VII. BARBIGERAE. Nutlets 1–4, verrucose or muricate, lanceolate to ovate-lanceolate, dorsally convex, laterally rounded or obtuse, homomorphous with the abaxial one always developing; style reaching only to ⅓ height of nutlets or in varying degrees longer, sometimes even somewhat surpassing them.

Nutlets normally solitary or rarely 2; style reaching 1/3–1/2 height of nutlets. . . . . 25. *C. decipiens.*
Nutlets normally 4; style reaching 2/3 height of nutlets or beyond.
  Spike solitary; style evidently surpassing nutlets. . . . . 26. *C. patula.*
  Spike geminate or ternate; style almost always shorter than nutlets.
Hairs arming calyx-lobes very coarse, subobese; plant usually with an erect central axis; insular endemic. . . . 27. *C. foliosa.*
Hairs arming calyx-lobes slender, not conspicuously thickened; plant irregularly branched.
  Corolla conspicuous; hirsute plants almost confined to coastal drainage of California. . . . . 28. *C. intermedia.*
  Corolla inconspicuous; plants of the Great Basin and Californian deserts.
    Plant spreading hirsute. . . . . 29. *C. barbigera.*

Plant with appressed hairs.
Nutlets verrucose or verrucose-muriculate.....30. *C. nevadensis*
Nutlets spinular-muricate.....31. *C. scoparia.*

25. **C. decipiens** (Jones) Heller. Loosely branched herb 1–4 dm. high, slender, strigose and frequently short-hispid; leaves rather few, linear, obtuse, 1–3 cm. long, 1–3(–4) mm. broad, strigose and sometimes hispid, minutely pustulate; spikes geminate or rarely ternate or solitary, slender, becoming loosely flowered or congested, 4–10 cm. long, naked; corolla inconspicuous to conspicuous, 0.8–3.5 mm. broad; fruiting calyces ovate to ovate-oblong, strictly ascending, asymmetrical, 2.5–7(–9) mm. long, deciduous, sessile; mature calyx-lobes lance-linear, decidedly connivent above with the tips frequently spreading or even recurving, midrib thickened and usually evidently hirsute, margins strigose, abaxial lobe evidently the longest and most hirsute; ovules 4; nutlets 1 or rarely 2, next the abaxial calyx-lobe, ovate-lanceolate or occasionally narrowly ovate, 1.5–2.4 mm. long, usually granulate or muriculate-granulate, muricate-papillate or low-tuberculate, usually brownish, back convex, sides rounded, groove open or closed but always dilated below to form a definite areola; gynobase short, ⅓–½ height of nutlet; style much surpassed by nutlet, ½–⅔ the height of nutlet.—Muhlenbergia viii. 48 (1912).

Var. **genuina.** Corolla inconspicuous, less than 1 mm. broad.—*Krynitzkia decipiens* Jones, Contr. W. Bot. xii. 6 (1910). *C. decipiens* Heller, l. c.

Southern Nevada, western Arizona and Southern California.

Nevada: Logan, *Kennedy 1838* (G, UC); Rhyolite, 1072 m. alt., *Heller 9632* (G). Arizona: Hot Springs, 1892, *Toumey* (UC). California: Kernville, *Brandegee* (UC); sandy places near Palm Springs, 120 m. alt., *Spencer 2072* (G); desert sand, mouth of Tahquitz Canyon, 210 m. alt., *Spencer 1522* (G); Whitewater, 300 m. alt., *Jones* (UC); without locality, *Palmer 150* (G).

Var. **corollata**, var. nov., a varietate genuina differt corolla conspicua 2–3.5 mm. lata.

Extreme western margin of the Mohave Desert and the adjacent coastal slopes.

California: Fort Tejon, *Xantus 85* (G); Sespe Creek near Ten Sycamore Flat, *Abrams & McGregor 173* (G); Matilija Canyon, Ojai Valley, 1896, *Hubby 20* (G); towards foothills, Ojai Valley, 1896, *Hubby 21* (G, type); Roble Canyon, San Rafael Mts., 1020 m. alt., *Hall 7408* (G, UC); Santa Inez Mts., 1888, *Brandegee* (UC); Huron, Fresno Co., *Brandegee* (UC); without locality, *Brandegee* (UC).

This species is probably most related to *C. intermedia* and *C. neradensis* and has been somewhat confused with them. It differs, how-

ever, in having a very short style and gynobase and normally but one or rarely two nutlets.

26. **C. patula** Greene. Sparsely and loosely branched herb 5–15(–30) cm. high; stems strigose and sparsely short-hispid; leaves linear or lance-linear, 1–5 cm. long, 1–3 mm. broad, acutish, appressed-hispid, minutely pustulate; spikes solitary, with a few leafy bracts towards the base; corolla medium-sized, tube ca. 2 mm. long, limb 1.5–3 mm. broad, lobes short-oblong, ascending, ca. 1 mm. long, throat funnelform, appendages hemispherical; fruiting calyces ovate-oblong, 5–6 mm. long, obscurely biserial, subsessile, asymmetrical, base broadly conical or rounded; mature calyx-lobes lance-linear, connivent above with the herbaceous tips spreading, margins shortly white-villous, midrib thickened and densely tawny-hispid, abaxial lobe evidently the longest; nutlets 4, homomorphous, ca. 1.9 mm. long, oblong-ovate, acute, finely tessellate-granulate, tuberculate or muricate, base somewhat truncate, back convex, groove closed or nearly so and divaricately forked at base, at times open at the fork to form a small triangular areola; gynobase subulate, almost as long as the nutlets; style evidently surpassing nutlets.—Pittonia i. 265 (March 1889). *C. Pondii* Greene, l. c. 291 (April 1889).

Middle western Lower California and adjacent islands.

Lower California: San Bartolomé, 1889, *Pond* (G, isotype of *C. Pondii*); San Benito Island, 1897, *Brandegee* (G, UC).

Although probably most related to *C. intermedia* this species is readily separated by its solitary spikes and extreme southern range. *Cryptantha Pondii* is clearly a synonym. Although Greene described it as having "smooth and shiny" nutlets and ternate or quadrinate spikes the isotype sent Gray has granulate and tuberculate nutlets and solitary spikes as described above.

27. **C. foliosa** Greene. A stiffly erect divaricately branched herb 6–20 cm. high; stems solitary, straight, usually forming a conspicuous central axis, short-hispid below but becoming somewhat strigose above, branches well developed, widely spreading; leaves lanceolate to broadly linear, obtuse or rarely acutish, 2–6 cm. long, 2–5(–7) mm. broad, appressed-hispid, abundantly and minutely pustulate; spikes dense, 1–4 cm. long, geminate or ternate, naked; corolla evident, limb 2–3 mm. broad; fruiting calyces ovate-oblong, stiff, 5–7 mm. long, strongly biseriate, subsessile, subpersistent, base roughly conical; mature calyx-lobes lance-linear, towards the tips herbaceous and somewhat spreading, towards base indurated, thickened midrib armed with short

excessively coarse almost inflated pungent tawny hairs, margin strigose; nutlets 4, homomorphous, narrowly ovate, acute, ca. 1.5 mm. long, brownish and somewhat mottled, finely tessellate-granulate, tuberculate or muricate, back convex, edges obtusely angled, base rounded, groove narrowly dilated towards base where divaricately forked and closed; gynobase narrow, ca. 0.8 mm. long, ca. ⅔ height of nutlets; style reaching tip of nutlets.—Pittonia i. 113 (1887). *Krynitzkia foliosa* Greene, Bull. Calif. Acad. Sci. i. 205 (1885).

Endemic to Guadalupe Island, off the west coast of Lower California.

Lower California: Guadalupe Island, *Palmer 68, 842* and *877* (G), *Anthony 238* (G, UC), *Greene* in 1885 (G, UC, isotypes), *Townsend* (UC), *Brandegee* in 1897 (UC).

Readily recognized because of its peculiar habit of branching, congested spikes, coarsely armed calyx-lobes and small nutlets.

28. **C. intermedia** (Gray) Greene. Erectly branched commonly stiff and very hirsute herb 1.5–5 dm. high; stems several or solitary, erect, commonly hirsute but frequently more or less strigose; leaves lanceolate to linear or rarely somewhat oblanceolate, acute to obtuse, 2–6(–7.5) cm. long, 1–5(–7) mm. broad, hirsute or strigose, usually inconspicuously pustulate; spikes naked, geminate to quinate but commonly ternate, 5–15 cm. long, usually stiff; corolla conspicuous, 2–8 but commonly about 5 mm. broad; fruiting calyces ovate-oblong, 2–7 but commonly 4–6 mm. long, ascending or strict, deciduous, slightly asymmetrical, lowermost not conspicuously biserial, pedicels ca. 0.5 mm. long; mature calyx-lobes lance-linear, connivent above with tips usually spreading or recurving, margin appressed-hispid or short-villous, midrib thickened and pungently hirsute, abaxial lobe longest and most hirsute; nutlets commonly 4, homomorphous, lance-ovate, ca. 2 (1.5–2.3) mm. long, more or less coarsely and decidedly tuberculate or verrucose, frequently somewhat granulate, grayish or brownish, margins slightly angled, back convex, groove narrow or closed but gradually dilated towards base into a small triangular areola; gynobase ⅔–¾ height of nutlets, narrow; style usually about reaching the nutlet-tips or rarely slightly surpassing or surpassed by them.—Pittonia i. 114 (1887). *Eritrichium intermedium* Gray, Proc. Am. Acad. xvii. 225 (1882). *Krynitzkia intermedia* Gray, Proc. Am. Acad. xx. 273 (1885); Synop. Fl. N. Am. ii. pt. 1, Suppl. 426 (1886). *C. quentinensis* Macbr. Contr. Gray Herb. n. s. lvi. 58 (1918). *C. barbigera*, var. *Fergusonae* Macbr. l. c. 59. *C. intermedia*, var. *Johnstonii* Macbr. l. c. 59.

Coastal drainage from northern California to northern Lower California, and infrequent along the desert borders.

BRITISH COLUMBIA: probably introduced in ballast, vicinity of Victoria, *Macoun 672* (G). CALIFORNIA: Scott River Valley, 1899, *Gilbert* (UC); Castilla, *Eastwood 1366* (G); McCloud River near fish hatchery, *Heller 13021* (G); near Redding, *Heller 7883* in pt. (G); Hyampom, 1883, *Rattan* (G); Berry Canyon near Clear Creek, *Heller & Brown 5510* (G); 16 km. east of Alder Springs, *Heller 11461* (G); Colusa Co., 1884, *Curran* (G); Stony Creek, Colusa Co., *Rattan 43* (G); north side of Marysville Butte, *Heller 11368* (G); St. Helena, 1896, *Jepson* (G); Oakley, 1900, *The Postmaster* (UC); table hills near Sheepranch, *Davy 1622* (UC); San Antonio Creek, *Davy 1567* (UC); Rancho Encinal, Monterey Co., 1903, *Kellogg* (G); Carmel River above Mission, *Heller 6587* (G); Soledad, 1881, *Congdon* (UC); Aliso Canyon, 1897, *Barber* (UC); Cuyama, 1896, *Eastwood* (UC); Ellwood, *Eastwood 10* (G, UC); Painted Cave Ranch, *Eastwood 67* (G, UC), Santa Barbara, *Rothrock 88* (G); Santa Barbara, *Elmer 3866* (G); Ojai Valley, 1896, *Hubby 22* (G); Saugus, 1889, *Brandegee* (UC); Saugus, 1901, *Davy* (UC); San Fernando Wash, 1913, *Eastwood* (G); San Fernando Mts., 1882, *Nevin* (G, UC); San Fernando, *Nevin* (UC); Los Angeles, *Nevin* (UC); Los Angeles, *Gambel* (G); Los Angeles, 1880 to 1882, *Nevin* (G, including TYPE of *C. intermedia*); sandy creek margin, Verdugo Canyon, *Macbride & Payson 748* (G); Elysian Park, 1901, *Setchell* (UC); Santa Monica Experiment Station, *Barber 48* (UC); Topango Canyon, 1916, *Crawford & Hiatt 257* (G); Playa del Rey, *Abrams 2512* (G, UC); San Pedro, 1889, *Brandegee* (UC); dry hillsides back of Laguna Beach, 150 m. alt., *Johnston 1934* (G); Santa Catalina Island, 1890, *Brandegee* (UC); Santa Catalina Island, *Grant 242* (UC); Santa Clemente Island, 1880, *Nevin & Lyon* (G, a peculiar form); hills near Pomona, *Baker 4744* (G); Claremont, *Chandler* (UC); Claremont, *Baker 4137, 4169* and *4773* (G); Claremont, *Johnston 1938* (G, TYPE of *C. intermedia*, var. *Johnstonii*); San Antonio Canyon, *Johnston 2046, 2047, 2048* and *2049* (G); near Upland, *Parish 11154* (G, UC), *Johnston 1957, 1959* and *1960* (G); east of Victorville, *Spencer 838* (G); rocky hillside, Victorville, 900 m. alt., *Munz & Harwood 3472* (UC); near Barstow, *Spencer 290, 294* and *2083* (G); Mohave Desert, *Lemmon 207* (G); vicinity of San Bernardino, *Parish 929* (UC), *1215* (G), *3660* (G, UC), *6940* (UC), *11117* (UC), *11299* (UC); San Bernardino, *Wright 98* (G); Colton, 1882, *Cleveland* (UC); Highland, *Spencer 1112* (G); vicinity of Riverside, *Hall 2991* (UC); San Jacinto Valley, 1897, *Reinhardt* (UC); Winchester, *Hall 399* (UC); Thomas Valley, *Hall 2180* (UC); Hemet Valley, 1890, *Orcutt* (UC); Hemet Valley, *Munz 5784* (G); Van Deventers, *Hall 1161* (UC); Saunders Meadow, San Jacinto Mts., *Spencer 2275* (G); Maillard Canyon near Banning, *Spencer 2087* and *2063* (G); Snow Creek near Palm Springs, *Spencer 2065b* (G); Cabazon Station, *Abrams 3214* (G); Palm Springs, *Spencer 850, 851, 852* and *863* (G); Palm Springs, *Ferguson 42* (G, TYPE of *C. barbigera*, var. *Fergusoniae*); Tahquitz Canyon, *Spencer 1518* (G); Mission Canyon, *Spencer 1783* (G); dry hills 5 km. east of Murietta, 450 m. alt., *Munz & Johnston 5317* (UC); Moro Hills near Fallbrook, *Abrams 3317* (G); Foster, *Hall 3883* (UC); Mesa Grande, *Spencer 1179* (G); Ramona, 1894, *Brandegee* (UC); Witch Creek, 1894, *Alderson* in pt. (G); Descanso Grade, 1906, *K. Brandegee* (UC); Del Mar, 1894, *Brandegee* (UC); La Jolla, *Clements 106* (G, UC); and *107* (G); Point Loma, *Eastwood 2937* (G); Point Loma, 1903, *K. Brandegee* (UC); San Diego, *K. Brandegee* (UC); San Diego, *Greene* (UC); San Diego, *Spencer 36, 37, 1348, 1349* and *1350* (G); San Diego, *Palmer 257* (G); San Diego, *Brandegee 3416* (G, UC) Laguna Mts., *Spencer 922, 923, 929* and *938* (G); Laguna, 1885, *Cleveland 920, 921* and *2275* (G); near Campo, 1885, *Orcutt 1278* (UC); near Campo, *Abrams 3556* (G). LOWER CALIFORNIA: Todos

Santos Island, *Anthony 213* (G, UC) and *204* (G); Ensenada, 1889, *K. Brandegee* (UC); Burro Canyon, 1895, *Brandegee* (UC); Cariso Creek, 1893, *Brandegee* (UC); San Quentin Bay, *Palmer 608* (UC) and *695* (G, TYPE of *C. quentinensis;* UC, ISOTYPE); without locality 1883, *Orcutt* (G).

A variable and perplexing species the sharp delimitation of which seems quite impossible. At the northern extreme of its range it passes into *C. Hendersoni.* But outside the zone of intergradation in the northernmost counties of California, *C. intermedia* is readily distinguished from the more northerly ranging *C. Hendersoni* by having narrower, lance-ovate, strongly verrucose nutlets and decidedly pungent hairs on stem and calyx. In the southern part of its range *C. intermedia* passes even more completely into *C. barbigera* and *C. nevadensis.* The two latter species inhabit the desert and probably represent modifications of the *C. intermedia*-stock as adaptations to that extreme environment. Material transitional between *C. intermedia, C. barbigera* and *C. nevadensis* comes from the western margin of the Californian deserts or from the hot interior coastal valleys more or less connected with the desert proper. *Cryptantha barbigera* and *C. nevadensis* differ from *C. intermedia* primarily in their minute corollas. *Cryptantha barbigera* appears to be a derivative of *C. intermedia* with bristly stems and evidently villous as well as hirsute calyces. On the other hand, *C. nevadensis* has tended to develop a wiry habit, strigose pubescence and very elongate nutlets. Intergradation among them being beyond question, *C. Hendersoni, C. intermedia* and *C. nevadensis,* with much justification, might be treated as mere varieties of *C. barbigera.* It seems best to adhere to the traditional classification, however, and retain the four groups as specific, since such an extended concept as their union would be unwieldy. As various other species in this genus are more or less connected by local intergradation an unfortunate precedent might be set if, in the present instance, drastic reductions were made because of the occurrence of local transition.

The species varies considerably in pubescence. Though the plant is sometimes closely short-strigose, the common form is densely pungent-hirsute throughout. In some forms the calyx is appressed-hispid, in others hispid-villous or even somewhat silky, though the midrib of the calyx-lobe is practically always more or less pungent-hirsute. *Cryptantha quentinensis* is a form which is not hirsute and has a rather silky calyx. It is clearly a phase of *C. intermedia* and is not a relative of *C. oxygona* as its author suggests. *Cryptantha barbigera*, var. *Fergusonae* is a form of *C. intermedia* with rather long-villous calyx-lobes. The type is one of the suite of puzzling plants from the desert

border which connect *C. barbigera* and *C. intermedia*. *Cryptantha intermedia*, var. *Johnstonii* differs from *C. barbigera*, var. *Fergusonae* only by not being conspicuously villous on the calyx. It appears to be one of the very large-flowered, coarse phases of *C. intermedia*. Material of *C. intermedia* from the eastern margin of the Colorado Desert not infrequently has the style definitely surpassing the nutlet-tips whereas that from other regions seems uniformly to have the style not reaching beyond the nutlets.

29. **C. barbigera** (Gray) Greene. Erectly branched hirsute herb 1–4 dm. high; stems solitary or several, very bristly and sparsely if at all strigose; leaves oblong to lance-linear, obtuse, 1–5(–7) cm. long, 3–7(–13) mm. broad, hirsute, inconspicuously pustulate; spikes geminate or rarely solitary or ternate, naked, becoming as much as 15 cm. long; corolla inconspicuous, limb 1–2 mm. broad; fruiting calyx 5–10 mm. long, ovate-oblong or oblong-lanceolate, ascending, asymmetrical, deciduous; pedicels 0.3–0.7 mm. long, villous; mature calyx-lobes lanceolate to linear-lanceolate, connivent above with tips recurved, margin conspicuously long white-villous, midrib thickened and hirsute, abaxial lobe slightly the longest; nutlets 1–4, homomorphous, lance-ovate, 1.5–2.5 mm. long, strongly verrucose, usually brownish, back convex, edges obscurely angled or rounded, groove opened or closed but towards base gradually dilated to form a triangular areola; gynobase narrow, $\frac{2}{3}$–$\frac{3}{4}$ height of nutlets; style reaching to or slightly beyond the nutlet-tips.—Pittonia i. 114 (1887). *Eritrichium barbigerum* Gray, Synop. Fl. N. Am. ii. pt. 1, 194 (1878). *Krynitzkia barbigera* Gray, Proc. Am. Acad. xx. 273 (1885). *K. mixta* Jones, Contr. W. Bot. xiii. 6 (1910).

Southern California and southern Utah, to Arizona and northern Lower California.

Utah: deep sand, Diamond Valley, *Goodding 889* (G, UC); St. George, 900 m. alt., *Jones 5106* (UC, isotype of *K. mixta*); Utah, *Parry 171* (G, type of *E. barbigerum*); without locality, *Palmer 348* (G). California: floor of canyon, Silver Canyon in White Mts. east of Laws, *Heller 8270* (G, UC); Providence Mts., *Munz, Johnston & Harwood 4281* (UC); Baxter, *Parish 9869* (UC); sandy places near Barstow, 900 m. alt., *Spencer 2089* and *2092* (G); Victor, 780 m. alt., 1903, *Jones* (UC); Mohave Desert, 1880, *Lemmon* (G); sandy canyon floor, Palm Canyon, 300 m. alt., *Johnston 1053* (G); Palm Canyon, 210 m. alt., *Spencer 1513* (G); crevices of rocks near Indian Wells, 105 m. alt., *Spencer 1519* (G); Canyon Springs, *Hall 5856* (UC); desert sand, Indio, 90 m. alt., *Spencer 1516* (G); sandy wash and among rocks in lower hillsides, Shavers Well near Mecca, 75 m. alt., *Munz & Keck 4757* (G, UC); San Felipe Creek, *Eastwood 2710* (G); San Felipe Creek, 1894, *Brandegee* (UC); desert sand, Mountain Springs, 780 m. alt., *Spencer 187, 200a* and *862* (G); sandy places, Colorado Desert, *Spencer 189* and *191* (G); Colorado Desert, 1889, *Brandegee* (G); Colorado Desert, *Orcutt 2264* (UC). Arizona: Diamond

Creek, 1893, *Wilson* (UC); near Tempe, 1897, *Bolton* (UC); Verde Mesa, *Smart 126* (G); Nogales, 1892, *Brandegee* (UC); Benson, 1882, *Dunn* (UC); Patagonia Mts., 1902, *Orcutt* (UC); Clifton, *Rusby 285* (UC); Clifton, *Davidson 174a* (UC); mesas near Camp Lowell, 1881, *Pringle* (G); Tucson, 1894, *Toumey* (UC); Sabino Canyon, 1894, *Toumey* (UC); Tucson Mts., *Thornber 532* (UC); Tucson, 1907, *Loyd* (G); Yucca, 1912, *Wooton* (G); without locality, 1876, *Palmer* (G). LOWER CALIFORNIA: San Telmo, 1893, *Brandegee* (UC); San Esteban, 1889, *Brandegee* (UC); Lagoon Head, *Palmer 780* (G, UC); San Luis, 1889, *Brandegee* (UC); San Sebastian, 1889, *Brandegee*.

When Gray originally described *Eritrichium barbigerum* he had before him materal now referred to *C. barbigera*, *C. nevadensis* and *C. intermedia*. The plant here treated as *C. barbigera* constituted the bulk of the material first described as *E. barbigerum* and almost wholly that which he later designated as *Krynitzkia barbigera*. Parry's number 171, which is taken as type, is a large and very fine example of the species, having coarse leaves, and very elongate, apically recurved, long-villous calyx-lobes. In some of its forms the species is scarcely more than a minute-flowered phase of *C. intermedia*. When typically developed it is very characteristic because of its large leaves and conspicuously villous, elongate calyx-lobes.

30. **C. nevadensis** Nels. & Kenn. Slender, strigose herb 1–5 dm. high; stems erect or becoming flexuous, solitary or several, closely short-strigose and at times sparsely hirsute, closely or laxly branched; leaves linear-oblanceolate to linear, acute or obtuse, 1–4 cm. long, 1–5(–7) mm. broad, not numerous, appressed-hispid, more or less pustulate; spikes geminate or ternate, occasionally bracted toward the base, congested and somewhat glomerate or elongate and becoming 15 cm. long; corolla inconspicuous, limb 1–2 mm. broad; fruiting calyx oblong-ovate to lanceolate, 5–12 mm. long, ascending, slightly asymmetrical, pedicels ca. 0.5 mm. long; mature calyx-lobes lanceolate or linear, connivent above with the slender tips usually recurving, margins more or less villous, midrib thickened and hirsute; nutlets 4, homomorphous, verrucose or towards the tip muriculate, lance-ovate to lanceolate, 2–2.9 mm. long, back convex, margins somewhat angled, groove open or closed but below dilated into a small areola; gynobase narrow, $\frac{2}{3}$–$\frac{3}{4}$ length of nutlets; style reaching to or almost to the tips of the nutlets.—Proc. Biol. Soc. Wash. xix. 157 (Nov. 1906).

Var. **genuina**. Stems very slender, usually flexuous, strigose; calyx 8–12 mm. long; nutlets lanceolate, long acuminate, back verrucose but conspicuously muricate towards the apex, ca. 2.5 mm. long. —*C. nevadensis* Nels. & Kenn. l. c. *Krynitzkia barbigera*, var. *inops* Brandg. Zoe v. 228 (Sept. 1906). *C. barbigera*, var. *inops* Macbr. Proc. Am. Acad. li. 548 (1916). *C. arenicola* Heller, Muhl. ii. 242

(Dec. 1906). *C. leptophylla* Rydb. Bull. Torr. Bot. Cl. xxxvi. 678 (1909).

Deserts from Utah and Nevada to Arizona and northern Lower California.

Utah: St. George, *Palmer 350* (NY, type of *C. leptophylla*). Nevada: Trinity Mts., 1500 m. alt., *Watson 850* (G); stony north slope, Moapa, *Goodding 2201* (G, UC); Rhyolite, 1072 m. alt., *Heller 9657* (G); foot of cliffs, Meadow Valley, *Goodding 2165* (G); open sand, Candelaria, 1800 m. alt., *Shockley 288* (UC). Arizona: Grand Canyon, 1888, *Gray* (G); Diamond Creek, 1893, *Wilson* (UC); Yucca, 1912, *Wooton* (G); without locality, 1876, *Palmer* (G). California: Swansea, *Hall & Chandler 7178* (UC); Panamint Canyon, *Hall & Chandler 7038* (G, UC); sand hills west of Laws, *Heller 8203* (G, UC); Surprise Canyon, 640 m. alt., *Coville & Funston 700* (G); The Needles, 1884, *Jones* (UC); Kramer, 1905, *K. Brandegee* (UC); Tehachapi, 1905, *K. Brandegee* (UC); around and under small bushes, Barstow, *K. Brandegee 157* (G, UC); 16 km. east of Daggett, 600 m. alt., *Munz & Harwood 3672* (UC); Hesperia, 1050 m. alt., *Parish 4850* (UC); sandy places, Mohave Desert, 300 m. alt., *Spencer 438* (G); dry sandy plain, 5 km. east of Warren's Well, 960 m. alt., *Munz & Johnston 5176* (G); deep sand at mouth of Tahquitz Canyon, 210 m. alt., *Spencer 1525* (G); deep sand, Palm Springs, 135 m. alt., *Spencer 848* (G); San Felipe, 1898, *Purpus* (UC); desert sand, Mountain Springs, 678 m. alt., *Spencer 188* and *859* (G); sand, Colorado Desert, *Spencer 184* (G); gravelly hills, Colorado River, 1854, *Bigelow* (G). Lower California: mountains of northern Lower California, *Orcutt 1279* (UC).

Var. **rigida**, var. nov., erecta non rariter plus minusve hirsuta; calycibus 5–10 mm. longis; nuculis oblongo-ovatis acutis verrucosis ca. 2 mm. longis.

Western portion of Mohave Desert and neighboring coastal slopes; also in western Arizona.

California: Bakersfield, *Davy 1875* (UC); Poso Creek, *Hall & Babcock 5014* in pt. (UC); sandy soil, Pampa Station, *Heller 7645* (G, UC); high ridge west of McKittrick, *Heller 7788* (G, UC); Fort Tejon, *Xantus 85* (UC); Mohave, *Davy 2161* (UC); Palmdale to Little Rock, *Davy 2291* (UC); Llano Verde, *Davy 2306* (UC); desert sand, Hesperia 930 m. alt., *Spencer 389, 403* and *419* (G); sand, Mohave Desert, *Spencer 411* and *555* (G); hills bordering Mohave Desert, 1882, *Pringle* (G, type). Arizona: Wickenburg, *Jones 343* (G); Verde Mesa, *Smart* (G).

This species was first described as *Krynitzkia barbigera*, var. *inops*. If the varietal name is to be accepted it is only after *C. intermedia* has been reduced to a variety of *C. barbigera*. *Cryptantha nevadensis*, var. *genuina* is a striking plant on account of its wiry, strigose, usually flexuous stems, very elongate calyces and lanceolate attenuate nutlets. Its habit is suggestive of *C. dumetorum*, since it grows in shelter of shrubs and frequently scrambles up through them. The stems are also very brittle. The variety *rigida*, with which the var. *genuina* is confluent, has the habit and nutlets of some forms of *C. intermedia*.

From that species it differs in its small corollas and in invariably having strigose pubescence. The variety intergrades with *C. intermedia* and through it *C. nevadensis*, var. *genuina* is related to *C. intermedia* and eventually to *C. barbigera*. The axial nutlet of *C. nevadensis*, var. *genuina* is frequently somewhat smoother than the others and usually has a closed groove.

31. **C. scoparia** Nels. Erectly branched stiff usually strigose herb 1–3.5 dm. high; stems closely short-strigose and frequently also sparsely hispid; leaves linear to lance-linear, obtuse, 2–4 cm. long, 1–3 mm. broad, strictly ascending, strigose or appressed-hirsute, finely pustulate; spikes stiff, naked, solitary or geminate, 2–10 cm. long; corolla inconspicuous, tube about equalling calyx, limb ca. 1 mm. broad; fruiting calyx ovate-oblong, 5–6 mm. long, strictly ascending, subsessile, slightly asymmetrical, becoming rather obscurely biserial at maturity and 5–10 mm. distant; mature calyx-lobes lance-linear, stiffish, usually subconnivent above with the herbaceous tips somewhat spreading, midrib thickened and hirsute, margins shortly canescent-villous, axial lobe slightly the longest; nutlets 4, homomorphous, lanceolate to broadly lanceolate, 1.8–2.2 mm. long, antrorsely spinulose-muriculate especially towards apex, margins and base rounded, groove narrow and forked below where occasionally open to form a small triangular areola; gynobase subulate, about $\frac{3}{4}$ height of nutlets; style reaching to tip of nutlets.—Bot. Gaz. liv. 144 (1912); Macbr. Contr. Gray Herb. n. s. xlviii. 48 (1916). *C. muriculata*, var. *montana* Nels. Erythea vii. 69 (1899).

Southwestern Wyoming, southern Idaho and eastern Washington.

WYOMING: Granger, 1898, *Nelson* (G, ISOTYPE of *C. muriculata*, var. *montana*). IDAHO: loose, disturbed soil near road, Challis, 1620 m. alt., *Macbride & Payson 3221* (G); Big Butte Station, *Palmer 204* (G); Aberdeen, *Piper 5030* (G); sagebrush land, Minidoka, *Nelson & Macbride 1801* (G), *1311* (G, ISOTYPE of *C. scoparia*); dry slopes, Castleford, *Nelson & Macbride 2231* (G); Buhl, *Nelson & Macbride 1703* (G). UTAH: Ogden Hot Springs, 1903, *Stokes* (UC). WASHINGTON: plains, Morgan's Ferry, *Suksdorf 405* (G) and *1494* (UC).

In gross habit much suggesting *C. nevadensis*, but differing in its shorter fruiting calyces and particularly in its spinulose nutlets. In addition to these morphological differences the ranges of *C. nevadensis* and *C. scoparia* are separated by the northern half of Nevada.

Ser. VIII. MURICATAE. Nutlets 4, verrucose or coarsely tuberculate, triangular-ovate, decidedly homomorphous, back obtuse and bearing a suggestion of a medial ridge, with sides evidently

angled and beaded; style usually surpassing the nutlets though rarely only equalling them.

32. **C. muricata** (H. & A.) Nels. & Macbr. A tawny-green erect hirsute herb 1–10 dm. tall; stems solitary or several, conspicuously hirsute and rarely also short appressed-hirsute, usually stiff, branches few and ascending or paniculate; leaves linear to oblance-linear, 1–5(–9) cm. long, 2–4 mm. broad, villous-hirsute, usually inconspicuously pustulate; spikes few to very numerous, naked, geminate to quinate, 2–15 cm. long; corolla minute to conspicuous, 1–7 mm. broad; appendages well developed; fruiting calyx, ovate, 2–4 mm. long, deciduous, subsessile, older ones obscurely biserial; mature calyx-lobes lanceolate, decidedly connivent, once to twice length of nutlets, margins short-hispid, midrib thickened and tawny-hirsute; nutlets 4, homomorphous, ovate-triangular, 1.5–2.5(–3) mm. long, lucid or dull, verrucose or tuberculate, frequently somewhat granulate, margin angled and usually beaded, base truncate, back frequently obtuse-angled, groove narrow or closed and towards base broadly forking or dilated into a small areola; gynobase elongate, about $^4/_5$ length of nutlets; style much surpassing the nutlets or rarely scarcely reaching them.—Bot. Gaz. lxi. 42 (1916).

Var. **genuina.** Corolla conspicuous, 2–7 mm. broad; stems with (usually a few) well developed terminally floriferous lateral branches; spikes for the most part not especially numerous.—*Myosotis muricata* H. & A. Bot. Beechey 369 (1840). *C. muricata* Nels. & Macbr. l. c. *Eritrichium muriculatum* A. DC. Prodr. x. 132 (1846). *Krynitzkia muriculata* Gray, Proc. Am. Acad. xx. 273 (1885) *C. muriculata* Greene, Pittonia i. 113 (1887). *C. horridula* Greene, Pittonia v. 55 (1902).

Western California in and along the Coast Ranges from Monterey to Los Angeles counties.

CALIFORNIA: Point Sur, 1888, *Brandegee* (UC); Sur River, 1893, *Eastwood* (UC); Salinas River, 1885, *Curran* (UC, ISOTYPE of *C. horridula?*); Santa Lucia, 1897, *Plaskett* (UC); Pine Mts. back of San Simeon Bay, *Palmer 376* (G, UC); San Simeon, 1888, *Brandegee* (UC); Salinas River near Poza, 1902, *Eastwood* (G, UC); Painted Cave Ranch, *Eastwood 66a* (G); Santa Barbara, 1889, *K. Brandegee* (UC); dry hills near sea, Ventura, *Brewer 232* (G, UC); Topatopa Mts., 1650 m. alt., *Abrams & McGregor 94* (G); Santa Clara River, 1885, *Gray* (G); creek arroyo, Ojai Valley, *Hubby 24* (G); Sulphur Mt., *Hubby 23* (G); Oakgrove Canyon, Liebre Mts., 900–1200 m. alt., *Abrams & McGregor 343* (G); Leonis Valley, Antelope Valley, *Davy 1648* (UC); creek bed, Saugus, *K. Brandegee* (G, UC); Topango Canyon, Santa Monica Mts., *Crawford & Hiatt 326* (G); Sepulveda Canyon, Santa Monica Mts., *Abrams 2555* (G, UC); South Beach, 1898, *Barber* (UC); Los Angeles, 1880, *Nevin* (G); Pasadena, *Grant 238* in pt. (G); without locality, *Douglas* (G, ISOTYPE of *M. muricata*).

Var. **Jonesii** (Gray) Johnston. Corolla inconspicuous, 1–2.5 mm. broad; stems commonly solitary and erect or several and fastigiate, clothed to below middle with numerous very short floriferous branchlets; spikes usually short, very numerous, grouped to form an elongate leafy paniculate inflorescence.—Plant World xxii. 114 (1919). *Krynitzkia Jonesii* Gray, Proc. Am. Acad. xx. 274 (1885). *C. Jonesii* Greene, Pittonia i. 113 (1887). *C. vitrea* Eastw. Proc. Calif. Acad. Sci. ser. 3, ii. 292 (1902); Fl. S. Fk. Kings River 77 (1902).

Middle and Southern California and the northern part of Lower California.

CALIFORNIA: gravelly slopes, Alder Springs, Glenn Co., *Heller 11449* and *11450* (G); Lake County, 1898, *Purpus* (UC); Mt. St. Helena, *K. Brandegee* (G, UC); Tamalpais, 1892, *Bioletti* (G); along railroad above West Point, Tamalpais, 1907, *K. Brandegee* (UC); Mt. Tamalpais, 1899, *Congdon 40* (G); Tamalpais, 1892, *K. Brandegee* (UC); above Whitlocks, Mariposa Co., 1897, *Congdon 52* (G); Yosemite, 1897, *Congdon 41* (G); Leavitts Meadow, 1898, *Congdon* (G); Bubbs Creek, S. Fk. of Kings River, 1899, *Eastwood* (G, part of TYPE of *C. vitrea*); Tenaya Trail, Yosemite Nat. Park, 1650 m. alt., *Hall 8940* (UC); Ben Lomond, Santa Cruz Co., 1890, *Brandegee* (UC); Soledad, 1882, *Jones* (G); Santa Cruz, *Jones 2810* (G, TYPE of *K. Jonesii*); above Alma Soda Springs near "French Settlement," Santa Clara Co., *Heller 7491* (G, UC); Santa Cruz Island, 1888, *Brandegee* (UC); Santa Cruz Island, 1886, *Greene* (UC); dry sandy ground near Upland, 360 m. alt., *Johnston 1958* (G); side of road, San Antonio Canyon, 720 m. alt., *Johnston 2048a* (G); Summit of Cajon Pass, *Spencer 345* (G); sandy wash, Highland, 300 m. alt., *Spencer 1306* (G), dry sandy ground, San Bernardino, 360 m. alt., *Johnston 1886* (G); foothills, San Bernardino, *Parish 929* (G); dry mesas, San Bernardino Valley, 300 m. alt., *Parish 11118* (G, UC); stony sandy slopes, Banning, 692 m. alt., *Spencer 1781* (G); San Jacinto Valley, 1897, *Reinhardt* (UC); Chalk Hill, San Jacinto Mts., 1500 m. alt., *Hall 2052* in pt. (UC); Palamar Mts., 1200 m. alt., *Chandler 5355* (UC); Ramona, 1894, *Brandegee* (UC); Mesa Grande, 1220 m. alt., *Spencer 1178, 1302* and *1303* (G); Witch Creek, 1894, *Anderson* (G); Lakeside, 1894, *Brandegee* (UC); mesa, La Jolla, *Clements 108* (G, UC); in chaparral, vicinity of San Diego, 520 m. alt., *Spencer 38* (G, UC); Mission Hills, San Diego, *Abrams 3418* (G); Point Loma, 1906, *K. Brandegee* (UC); Point Loma, 1902, *Brandegee 1646* (G, UC). LOWER CALIFORNIA: Todos Santos Bay, 1885, *Greene* (UC); near U. S. border, 1884, *Orcutt 1022* (G); near Jamul, 1885, *Orcutt 1281* (G); Topa, 1884, *Orcutt 1127* (G); Vallederos, 1893, *Brandegee* (UC).

Var. **denticulata** (Greene), comb. nov. Corolla inconspicuous, 1–2 mm. broad; plant with a few well developed loose branches; spikes not numerous; nutlets usually larger than in var. *Jonesii*.—*Krynitzkia denticulata* Greene, Bull. Calif. Acad. Sci. i. 205 (1885). *C. denticulata* Greene, Pittonia i. 114 (1887). *C. densiflora* Nels. & Kenn. Proc. Biol. Soc. Wash. xix. 156 (1906).

Western Nevada and adjacent California, southward to western Arizona and the mountains of Southern California

NEVADA: Dog Valley Road, 1895, *Hillman* (UC); Clear Creek Canyon, 2000–2615 m. alt., *Baker 1381* (G, UC); Reno, 1884, *Curran* (G); near Reno, 1893, *Hillman* (UC); along railroad above Laughton's, 1894, *Hillman* (UC), Verdi, 1904, *Kennedy 952* (UC, ISOTYPE of *C. densiflora*); Hunter Creek, Washoe Co., 1800 m. alt., *Kennedy 1917* (G); western Nevada, 1884, *Curran* (G, UC, ISOTYPES of *K. denticulata*). ARIZONA: mesas near Camp Lowell, 1881, *Pringle;* Skull Valley, 1290 m. alt., 1903, *Jones 7028* (UC); Yucca; 1884, *Jones 26* (G). CALIFORNIA: Truckee, 1887, *Sonne* (UC); Donner Lake, 1888, *Curran* (UC); Summit Station, Placer Co., 2083 m. alt., *Heller 12886* (G); Mammoth, 1913, *K. Brandegee* (UC); open pine woods, Mt. Wilson, *Abrams 2590* (G); dry rocky canyon floor, Coldwater Fk. of Lytle Creek, 2100 m. alt., *Johnston 2073* (G, UC); rocky ground under pines near head of N. Fk. Lytle Creek, 2250 m. alt., *Johnston 2077* (G, UC); sunny rocky summit, Telegraph Peak, 2700 m. alt., *Johnston 1542* (G); open place on canyon floor, N. Fk. San Antonio Canyon, 2400 m. alt., *Johnston 1598* (G, UC); dry sunny canyon side, San Antonio Canyon, 1110 m. alt., *Johnston 1950* (G); Little Green Valley, *Hall 12* (UC).

A species readily recognized by its ovate-triangular nutlets, tawny pubescence, and characteristic yellowish-green herbage. It breaks up into three intergrading varieties. The var. *genuina*, characterized by its large corollas, occurs in western California. It varies noticeably in the size of the nutlets and fruiting calyces. The type of *C. muricata* is one of the coarse, large-flowered forms and was probably collected by Douglas somewhere between Monterey and Santa Barbara. The other varieties are small-flowered. The var. *Jonesii* commonly assumes a peculiar erect habit by which it can be distinguished at a glance from all other forms in the genus. The stems are usually single or several and fastigiate, and are erect, producing in the upper half or two-thirds abundant very short floriferous branchlets. Rarely the plant becomes diffusely branched. The distribution of var. *Jonesii* is peculiar. It occurs in the Coast Ranges from Santa Cruz to Glenn County, and in the middle Sierra Nevada. Jumping the several hundred kilometers occupied by the var. *genuina* it reappears in the vicinity of San Bernardino and is frequent from there south into Lower California. The var. *denticulata* is perhaps unworthy of recognition since it is frequently distinguishable from the var. *Jonesii* only with difficulty. It differs chiefly in habit, being sparsely and loosely long-branched. It grows in western Nevada in the general region of Reno, in California about Truckee, in western Arizona and in the pine belt of Southern California. The material from Nevada usually has coarsely granulate nutlets and perhaps might be separable from the southern material that I have associated with it.

Ser. IX. AMBIGUAE. Nutlets 1–4, smooth to papillate or tuberculate, ovate, dorsally low-convex, laterally rounded or obtuse

or occasionally acutish, homomorphous, no particular nutlet always developing; style reaching to $^2/_3$–$^3/_3$ height of nutlets.

Corolla conspicuous.
- Plant low, stiff, spreading, widely branched; spikes solitary..33. *C. mariposae.*
- Plant erectly branched, less rigid; spikes ternate or geminate.
  - Pedicels slender, evident, 2–3 mm. long; pedicels and calyx conspicuously long white-villous.....34. *C. crinita.*
  - Pedicels stout, inconspicuous, less than 1 mm. long; pedicels and calyx more or less hispid.
    - Nutlets usually single, commonly horizontal, equalling or longer than the short loosely connivent calyx-lobes.....35. *C. excavata.*
    - Nutlets usually 4, erect, evidently shorter than the decidedly connivent calyx-lobes.....36. *C. Hendersoni.*

Corolla inconspicuous.
- Nutlets minute, less than 1.5 mm. long; spikes bracted throughout.....37. *C. Traskae.*
- Nutlets usually 2–2.5 mm. long; spikes naked or bracted only at base.
  - Nutlets smooth, rarely finely granulate; spikes usually geminate; plant commonly 2–4 dm. tall.....38. *C. Torreyana*
  - Nutlets somewhat tuberculate, densely granulate or granulate-muricate as well as more coarsely roughened.
    - Plant closely strigose, pale, usually 2–3 dm. tall; spikes commonly geminate or ternate.....39. *C. simulans.*
    - Plant spreading-hispid, usually 1–1.5 dm. tall; spikes usually solitary or rarely geminate.
      - Nutlets with low rounded tubercules.....40. *C. ambigua.*
      - Nutlets with elongate papillae or spicules.....41. *C. echinella.*

33. **C. mariposae**, sp. nov., humilis saepe basaliter ramosa 5–15 cm. alta; ramis paucis laxe ascendentibus breviter strigosis; foliis paucis firmis oblanceolatis vel oblongo-oblanceolatis 0.8–1.8 mm. longis 2–5 mm. latis obtusis integerrimis adpresse breviter hispidis inconspicue pustulatis, superioribus paullo reductis, inferioribus oppositis subpersistentibus; spicis solitariis vel geminatis 3–10 cm. longis rigidis ebracteatis vel basem versus pauce folioso-bracteatis; floribus obscure biseriatis, inferioribus 5–10 cm. distantibus; calycibus fructiferis oblongo-ovatis 5–7 mm. longis ascendentibus subsessilibus; lobis calycis lineari-lanceolatis in costa infra medium cum setis flavescentibus horridis et in marginibus adpresse hispidis, supra medium breviter hirsutis et saepe recurvatis; corolla conspicua 3–6 mm. lata; nuculis homomorphis 4 (rare 1–2 abortis) ovatis acuminatis 2–2.5 mm. longis saepe granulatis basi truncatis margine rotundis vel obtusis ventre $^2/_5$–$^1/_2$ longitudinis ad gynobasem quadrangulari-columnarem ca. 1 mm. longam affixis; sulcis basem versus paullo gradatim ampliatis ad imam basem divaricato-furcatis et areolam triangularem profundam formantibus; stylo ca. 0.8 mm. longo quam nuculae evidenter breviori.

Known only from Mariposa County, California.

California: Mariposa, April 27, 1898, *Congdon* (UC); Mariposa, May 1903, *Congdon* (UC); Mariposa County, May 2, 1890, *Congdon C59* (type, Gray Herb.).

A peculiar plant with small, broad, thickish leaves and low, loosely branched, coarse, rigid stems. It has passed as *C. ambigua* and *C. barbigera* but is distinct from both, differing in its large corollas, low stiff habit, strigose stems and in the shape and attachment of the nutlets. In having basally truncate and acuminate nutlets it somewhat suggests *C. muricata*, var. *denticulata*, but is very different in its low habit, strigose pubescence and short style and gynobase. The young spikes are not so tawny as are those of *C. muricata.*

34. **C. crinita** Greene. Erectly branched herb 2–3 dm. high; stems appressed and spreading-hispid, branches numerous; leaves oblanceolate to oblance-linear, 2–4 cm. long, 2–4 mm. broad, obtuse, hirsute, evidently pustulate; racemes ternate or geminate, naked, 3–6 cm. long; corolla conspicuous, 3–5 mm. broad; fruiting calyces 5–6.5 mm. long, spreading, ovate-oblong, obscurely biserial, deciduous, divided, conspicuously villous, hairs very long and white, oldest calyces 5–10 mm. distant; pedicels well developed, 2–3 mm. long, long-villous; calyx-lobes linear, erect, slightly unequal, without a thickened midrib and pungent bristles; ovules 4; nutlet 1, next the axial calyx-lobe, ca. 3 mm. long, 1.3 mm. broad, erect, dull, brownish, ovate-lanceolate, densely muriculate-granulate, frequently coarsely tuberculate especially above the middle, apex attenuate, base obtusish, back convex, margin rounded or obtuse, groove opened towards base to form a small deep triangular areola; gynobase elongate, about half length of nutlet; style reaching to about ¾ height of nutlet.—Erythea iii. 66 (1895).

Known only from Shasta County, California.

California: bed of Stillwater Creek at Leightone, 1900, *Baker* (G, UC); Cow Creek, 1894, *Baker & Nutting* (UC); Stillwater, *Nutting* (UC); Shasta County, 1894, *Baker & Nutting* (UC, "Dup. of type ').

Distinguished from all other members of the genus by its unusually long white hairs on the calyx and on the well developed pedicels. Very distinct from, but probably most related to, *C. Hendersoni.*

35. **C. excavata** Brandg. Loosely and ascendingly branched herb 1–2 dm. tall; stems short hispid-villous and usually appressedly so; leaves not numerous, 1.5–3 cm. long, 1–2 mm. broad, linear or spathulate-linear, obtuse, appressed-hispid, minutely pustulate, upper ones evidently reduced; spikes ternate or geminate, 3–8 cm. long, naked; corolla conspicuous, ca. 4 mm. broad; fruiting calyx, broadly ovate, 2–2.5 mm. long and nearly as wide, asymmetrical, sessile, spreading,

base rounded or very broadly conic, becoming remote and obscurely biserial; mature calyx-lobes lanceolate, subequal, erect or loosely connivent, frequently one displaced by the tip of the decumbent nutlet which they barely exceed in length, margin short hispid-villous, midrib scarcely thickened and somewhat short-hirsute; ovules 4; nutlet 1 and usually horizontal or infrequently 2–3 and then erect, ovate-triangular, recurved-acuminate, ca. 2.5 mm. long, densely granulate or granulate-muriculate, commonly sparsely tuberculate, base decidedly truncate, sides obtuse or rounded, back convex, groove dilated towards base and forming a broad deep narrowly triangular suprabasal areola; gynobase narrow, ca. 1 mm. long, about $\frac{1}{3}$–$\frac{1}{2}$ length of nutlet; style reaching to $\frac{2}{3}$–$\frac{3}{4}$ height of nutlets.—Bot. Gaz. xxvii. 452 (1899).

Inner North Coast Ranges of California; rare.

California: occasional on shelving slopes of sand, Cache Creek, Yolo Co., *Baker 2886* (G, UC); Lake County, April, *K. Brandegee* (UC).

The solitary, decumbent, triangular nutlet and short calyx are distinctive of this species. It appears to be related to *C. Hendersoni* on one hand, and apparently to *C. decipiens* on the other. No particular nutlet seems to develop, even in the same spike, for adjacent calyces may each develop its nutlet in a very different position relative to the spike-axis.

36. **C. Hendersoni** (Nels.) Piper. Ascendingly branched hispid herb 1.5–5 dm. tall; stems single or numerous, sparsely and loosely branched above, hispid; leaves oblanceolate or linear, 2–5(–7) cm. long, 2–5 mm. broad, acute or obtuse, appressed-hispid, lower ones somewhat persistent and pustulate, upper ones reduced; spikes usually ternate, rarely geminate or quadrinate, naked or at times bracted toward very base, 2–8 or rarely even 20 cm. long; corolla conspicuous, tube about equalling calyx, limb 4–7 mm. broad; fruiting calyx ovate-oblong or narrowly ovate, 3–6 mm. long, ascending, slightly asymmetrical, lowermost becoming obscurely biserial and distant, base rounded or broadly conic; pedicels ca. 0.5 mm. long; lobes lance-linear or linear, somewhat connivent above with herbaceous tips usually somewhat spreading, margins densely appressed villous-hispid, midrib obscurely thickened and hispid; nutlets 4 or by abortion rarely fewer, broadly ovate or very rarely lance-ovate, 2–2.8(–3) mm. long, smooth or more or less coarsely granulate, frequently coarsely tuberculate and at times finely papillate-muricate, back low convex, sides rounded or rarely obtuse, base rounded or somewhat truncate; groove

closed or very narrow, broadly forked below; gynobase narrow, ca. 1.3 mm. long, becoming ½–⅔ as high as nutlets; style reaching to about ⁴/₅ height of nutlets or barely exceeding them.—Piper ex J. C. Nelson, Torreya xx. 44 (1920). *Allocarya Hendersoni* A. Nelson, Erythea vii. 69 (1899); Piper, Contr. U. S. Nat. Herb. xxii. 113 (1920). *C. monosperma* Greene, Pittonia v. 53 (1902). *C. incana* Greene, Leaflets i. 79 (1904). *C. grisea* Greene, l. c. *C. trifurca* Eastw. Bull. Torr. Bot. Cl. xxxii. 203 (1905). *C. grandiflora* Rydb. Bull. Torr. Bot. Cl. xxxvi. 679 (1909). *C. Torreyana*, var. *grandiflora* Nels & Macbr. Bot. Gaz. lxi. 43 (1916). *A. dichotoma* Brand in Fedde, Repert. xviii. 313 (1922). *C. scabrella* Piper, Proc. Biol. Soc. Wash. xxxvii. 95 (1924).

Western Idaho to southwestern British Columbia and south to the Sierra Nevada and northern parts of California.

IDAHO: sandy hillsides in open places or amongst trees, Juliaetta, *Henderson 4815* (G); hills about Lewiston, *Henderson 2811* (G); Lewiston, 1895, *Piper* (G); about Lewiston, 450–600 m. alt., *Heller 2998* (UC); Valley of Clearwater River, *Sandberg, MacDougal & Heller 10* (G, ISOTYPE of *C. grandiflora*); Clearwater, *Spalding* (G); abundant all over wooded and unwooded hills, Palouse Country, *Henderson 2811* in pt. (G); lava soil slope, Big Willo, 900 m. alt., *Macbride 109* (G, UC). BRITISH COLUMBIA: Fort Vancouver, *Tolmie* (G). WASHINGTON: Wawawai, *Piper 1941* and *1944* (G); Tacoma, 1894, *Van Renselaer* (G); Steilacoom, *Piper 372* (G); Cape Horn, *Piper 5018* (G); Falcon Valley, *Suksdorf 456* (G) and *3278* (UC); dry hillsides, Columbia River, western Klickitat County, *Suksdorf 180* (UC, ISOTYPE of *C. monosperma*). OREGON: along Hood River, *Heller 10112* (UC); Lone Rock, 890 m. alt., *Leiberg 116* (G, UC); rocky bank, 1.6 km. north of Tonquin, *Nelson 3093* (G); Willamette River below Portland, *Sheldon S10866* (G); dry rocky bank by roadside, Coalca, *Nelson 2109* (G); rocky hillside, 5 km. north of McNary, *Nelson 2083* (G); dry open ground in Bush's Pasture, Salem, *Nelson 3253* (G); dry soil by roadside, 5 km. south of Salem, *Nelson 2166* (G); Bridge Creek, *Howell 501* (G); loose basaltic rock on wall of canyon, Silver Creek Falls, Marion Co., *Nelson 4869* (G); 3.2 km. east of Curry-Douglas county-line on trail from Marial to West Fork, *Peck 3995* (G); dry soil along trail, Marial, *Nelson 1414* (G); rocky woods, Elk Rock, *Nelson 1254* (G); dry soil along trail near mouth of Mule Creek, Curry Co., *Nelson 1369* (G); steep seaward slope, The Heads, Port Oxford, *Peck 8473* (G); Grant Pass, *Piper 5105* and *5106* (G); Grant Pass, *Piper 5043* (G, ISOTYPE of *C. scabrida*); Applegate, *Durden* (UC); near Stinking Water, 1200 m. alt., *Leiberg 2362* (G, UC); Steins Mt., *Howell 500* (G); adobe soil, Steins Mt. opposite Devines Ranch, 1500 m. alt., *Leiberg 2465* (G, UC); without locality, hillsides, 1881, *Howell* (G, part of TYPE of *A. dichotoma*). CALIFORNIA: Hupa Valley, 1900, *Manning* (UC); Hupa Indian Reservation, 150 m. alt., *Chandler 1302* (G, UC); mountain slopes along road between Three Creeks and mouth of Willow Creek, Humboldt Co., 750 m. alt., *Tracy 3335* (UC); in chaparral in hills about Scotts Valley, 420–600 m. alt., *Tracy 1744* (UC); between Mud Flat and Bennet Springs on Newville-Covelo road, *Heller 11928* (G); Hough's Spring, Lake Co., 1882, *Cleveland* (UC); southeast side of Snow Mt. above Bonnie View, *Heller 13236* (G); Rush Creek, Trinity Co., *Yates 402* (UC); Klamathon, *Copeland 3550* (G, ISOTYPE of *C. trifurca*); dry hills near Yreka, *Butler 733*

(UC) and *1416* (G, UC); Edgewood, 1887, *Curran* (UC); Siskiyou County, 1890, *Edmonds* (UC); along streams in meadows, Parker Creek, Warner Mts., 1650 m. alt., 1910, *Taylor & Bryant* (UC); Goose Lake Valley, 1884, *Austin* (UC); Milford, 1892, *Brandegee* (UC); Mormon Bar, 1897, *Congdon 50* (G); Salmon Creek, Tulare Co., 2100 m. alt., *Hall & Babcock 5132* (UC); Nine Mile Creek, Tulare Co., *Culberton 4537* (G, ISOTYPE of *C. incana*); Redrock Meadows, Tulare Co., 2610 m. alt., *Hall 8394* (UC). NEVADA: Reno, 1898, *Purpus* (UC); Dog Valley Road, 1895, *Hillman* (UC).

In northwestern United States, where this plant appears to be rather common, it is almost the only species of *Cryptantha* with conspicuous corollas. In the past it has been much confused with *C. ambigua* and *C. Torreyana*, although in fact it seems to be most closely related to *C. intermedia*. In Idaho it tends to intergrade with *C. Torreyana*, but over most of its range it is readily separated by its conspicuous corollas, commonly ternate spikes and usually tuberculate nutlets. Occasional plants are hard to separate from *C. ambigua* although *C. Hendersoni* is for the most part pretty easily recognized by its large-flowered, ternate spikes projected above the leafy mass of the plant. *Cryptantha intermedia* completely intergrades with *C. Hendersoni* in northern California, although the overwhelming mass of material of *C. Hendersoni* is readily distinguished from its relative by its less stiff and scarcely pungent pubescence, and broader tuberculate nutlets. It has been found expedient to admit considerable range of nutlet-variation in *C. Hendersoni*. Among plants quite similar in gross habit, and commonly from within a small natural region, the nutlets frequently (from plant to plant) vary from entirely smooth and shiny, to simply granulate or decidedly tuberculate. Roughly it can be said, however, that more of the northern than southern material is smooth-fruited. *Cryptantha incana* and *C. grandiflora* are names applied to the phase with smooth and shiny nutlets. The other names cited apply to forms with roughened fruit. *Cryptantha scabrella* was based on a phase of *C. Hendersoni* from southern Oregon in which the nutlets are papillate-muricate. *Cryptantha monosperma* has similar though less abundant and less well developed papillae, and appears to be a form in which only 1 or 2 nutlets develop. The aborted nutlets appear to be the abaxial ones.

37. **C. Traskae**, sp. nov., pumila sparse laxeque ramosa 8–10 cm. alta; caulibus gracilibus strigosis ca. 1 mm. crassis; foliis paucis linearibus 1–2 cm. longis 1–1.5 mm. latis acutis strigosis rare hispidis inconspicue pustulatis; spicis solitariis vel geminatis 1–5 cm. longis cum bracteis linearibus 2–5 mm. longis numerosis ornatis; floribus obscure biseriatis maturitate 5–10 mm. separatis; corolla inconspicua ca. 1.5

mm. lata; calycibus fructiferis ovatis subsessilibus deciduis 2–3 mm. longis; lobis calycis maturi lanceolatis saepe acutis in costa cum setis flavescentibus brevibus horridis et in marginibus adpresse hispidis; nuculis 4 homomorphis ovatis vel anguste ovatis vix 1.5 mm. longis minutissime granulatis apicem versus plus minusve tuberculatis dorso convexis margine obtusis ventre ¾ longitudinis ad gynobasim angustam ca. 0.9 mm. longam adfixis; sulcis clausis basi in areolam minutam deltoideam dilatatis; stylo nuculas vix superante.

Known only from San Nicolas Island off the Californian coast.

CALIFORNIA: one locality, bare windswept cliffs, San Nicolas Island, April, 1901, *Trask* (G, TYPE); infrequent on bare windswept heights, April 1897, *Trask 57* (UC).

This endemic of San Nicolas Island was reported by Eastwood, Proc. Calif. Acad. Sci. ser. 3, i. 109 (1898), as *C. Torreyana*. It is evidently quite distinct from that species in its low habit, pubescence, bracteate inflorescence and small tuberculate nutlets. In habit it somewhat suggests *C. leiocarpa*. Its nutlets are about the same size and shape as those of that species, but differ in being tuberculate and in having a broadly forked groove and a small areola.

38. **C. Torreyana** (Gray) Greene. Commonly scantily and more or less strictly branched hispid herb, 1–4 dm. tall; stems solitary or frequently several, usually inconspicuously short-strigose as well as hispid; leaves oblanceolate or linear, strict or ascending, 2–5(–7) cm. long, 3–6(–8) mm. wide, obtuse or rounded, hispid, inconspicuously pustulate if at all so; spikes usually geminate, naked, 4–8(–15) cm. long, more or less projected from the leafy mass of the plant, very elongate and loosely flowered or congested and glomerate; corolla inconspicuous, ca. 1 mm. broad; fruiting calyces oblong-ovate or ovate-lanceolate, 2–7 mm. long, ascending, asymmetrical, base rounded or broadly conic, pedicels ca. 0.5 mm. long; mature calyx-lobes lanceolate to lance-linear, connivent above with tips usually spreading, midrib slightly thickened and hispid-hirsute, margins hispid-strigose; nutlets 4 (occasionally 1 or more aborted), usually broadly ovate, 1.5–2.2(–2.5) mm. long, 0.8–1.3 mm. broad, smooth and polished, usually mottled, rarely finely granulate, back very low-convex, sides rounded or obtuse, groove broadly forked below and closed throughout; gynobase about ½ height of nutlets, ca. 1 mm. tall; style reaching to ⅔ height of nutlets or rarely even to their tips.—Pittonia i. 118 (1887).

Var. **genuina.** Fruiting calyx 3.5–8 mm. long; style clearly surpassed by nutlets; plants usually over 2 dm. tall, not conspicuously

hispid.—*Krynitzkia Torreyana* Gray, Proc. Am. Acad. xx. 271 (1885). *C. Torreyana* Greene, l. c. *K. Torreyana*, var. *calycosa* Gray, l. c. *C. Torreyana*, var. *calycosa* Greene, l. c. 119. *C. calycosa* Rydb. Mem. N. Y. Bot. Gard. i. 331 (1900). *C. affinis*, var. *flexuosa* Nels. Bot. Gaz. xxx. 195 (1900). *C. flexuosa* Nels. New Man. Bot. Cen. Rocky Mt. 416 (1909).

Extreme western Wyoming and northern Utah, westward to Washington and California, and northward through British Columbia to southern Alaska.

ALASKA: Skagway, *Macoun 78736* and *Eastwood 802* (G). BRITISH COLUMBIA: Lytton, 1885, *Fletcher:* dry ground, Spences Bridge, 1889, *Macoun* (G); Cascade, *Macoun 66580* (G). WYOMING: open dry slopes, Nez Perces Creek, *Nelson 6224* (G); under sagebrush, 32 km. west of Big Piney, *Payson 2628* (G); on cobblestone flat, Jackson Lake, *Nelson 6546* (G, UC, ISOTYPES of *C. affinis*, var. *flexuosa*); Teton Forest Reservation, 1897, *Brandegee* (UC); abandoned field, Alpine, *Payson & Armstrong 3392* (G); dry hillside, hills east of Afton, 1980 m. alt., *Payson & Armstrong 3324* (G). UTAH: waste sandy ground, Juab, *Goodding 1068* (G, UC); dry plains, Red Butte Canyon, *Garrett 1869* (G); Dry Canyon near Salt Lake City, 1908, *Clemens* (G); dry gravelly soil, Peterson, Weber River, 1950 m. alt., *Pammel & Blackwood 3895* (G). IDAHO: slightly moist shady slopes, Salmon, 1350 m. alt., *Payson 1756* in pt. (G); dry soil, St. Anthony, *Merrill & Wilcox 842* in pt. (G); arroyos, Pocatello, *Henderson 4877* (G); dry lands, Montpelier, *Macbride 1690* (G); moist grassy bottoms, Ketchun, 1764 m. alt., *Nelson & Macbride 1215* (G); about Lake Waha, *Heller 3255* (G); moist ground, Moscow, 1899, *Henderson* (G); valley of North Fork of Coeur d'Alene River, 930 m. alt., *Leiberg 1539* (G, UC); near Juliaetta, *Sandberg, MacDougal & Heller 351* (G); lava rock hillside, Tamarack, 1260 m. alt., *Clark 165* (G); Palouse Country, *Henderson 2811* in pt. (G); Snake Country, *Burke* (G); slopes, loose soil, Silver City, 2100 m. alt., *Macbride 373* (G). WASHINGTON: Sprangle, *Piper 4140* (G); Clark Springs, *Kreager 93* (G); Cheney, *Tucker 127* (G); Pullman, *Piper 1945* (G); Kamiak Butte, *Piper 3091* (G); Rock Lake, 540 m. alt., *Sandberg & Leiberg 121* (G, UC); dry stony hillsides, Blue Mts., 1897, *Horner* (G); dry hillsides along Touchet River, Blue Mts., *Horner 380* (G); open woods, Falcon Valley, *Suksdorf 789* (UC); Falcon Valley, *Suksdorf 593* (G); western Klickitat County, 1886, *Suksdorf* (G); Yakima Region, 1882, *Brandegee* (UC). OREGON: hillsides near Snake River, *Cusick 1913* (G, UC); dry ground, Rock Creek, 10 km. west of Haines, *Peck 3609* (G); dry woods on West Fork, *Peck 1369½* and *1416* (G); Pelican Bay, *Copeland 3481* (G); Klamath Falls road, 41 km. east of Ashland, *Peck 9295* (G); dry stony hilltop 3.2 km. southeast of Klamath Falls, *Peck 9447* (G); Grant Pass, *Piper 5044* (G). NEVADA: steep dry hillsides, Bieroth's Ranch, McDonald Creek, 1950 m. alt., *Nelson & Macbride 2151* (G); East Humboldt Mts., 2100 m. alt., *Watson 858* (G, UC); near Carson City, 1866, *Anderson 12* (G); Sprucemont, *Jones 6838* (UC); Incline Road, Lake Tahoe, 1890 m. alt., *Kennedy 1428* (UC); Peavine Foothills, 1895, *Hillman* (UC); foothills near Peterson's Ranch, Truckee Valley, 1894, *Hillman* (UC). CALIFORNIA: Hupa Indian Reservation, 150 m. alt., *Chandler 1303* (G, UC); Supply Creek, Hupa Valley, *Davy & Blasdale 5730* (UC); Kneeland Prairie, 750 m. alt., *Tracy 3071* (UC); High Prairie on Bald Mt., 1650 m. alt., *Tracy 4560* (UC); Afton, 30-90 m. alt., *Tracy 3655* (UC); open places on brushy slopes, 1650 m. alt., *Tracy 3944* (UC); dry hillside at Alder Point on Eel River, 150 m. alt., *Tracy 1879* (UC); Eel

River, 1893, *Blankinship* (UC); Ukiah, *Bolander 3916* (UC); gravelly slope about 16 km. east of Alder Springs, *Heller 11450* (UC); gravelly places, Alder Springs, 1260 m. alt., *Heller 12759* (G); gravel near trees, between Bartlett and Allen Springs, *Heller 12372* (G); Kelsey, 1889, *K. Brandegee* (UC); Camp Badger, 1892, *Holway* (UC); Snow Mt., 1892, *K. Brandegee* (UC); among chaparral, 10 km. northwest of Lakeport, *Tracy 1653* and *1731* (UC); moist shady ground, Lake County, *Rattan 42* (G); Napa Valley, *Torrey 330* (G); brushy places near stream, 13 km. above Ruth, Trinity Co., *Tracy 4301* (UC); Yreka, *Heller 7995* (G, UC); dry land near Yreka, *Butler 762* and *1310* (UC); Sisson, 1887, *Brandegee* (UC); Sisson, 1902, *Setchell & Dobie* (UC); Ager, 1887, *K. Brandegee* (UC); Fort Bidwell, *Manning 160* (UC); red gravelly hillside, Modoc Co., 1893, *Baker* (UC); Montgomery Creek, Shasta Co., *Eastwood 622* (G); Burney, *Eastwood 689* (G); Battle Creek Meadows, Lassen Butte Region, *Eastwood 1894* (G); Pine Creek, Lassen Co., 1894, *Baker & Nutting* (UC); ridge east of Red Clover Valley, Plumas Co., *Heller & Kennedy 8718* (G); Red Clover Valley, *Heller & Kennedy 8754* (G, UC); Prattville, *Heller & Kennedy 8773* (G, UC); open places in the chaparral near Cohasset, *Heller 11912* (G); open places in pine forest, Butte Meadows 1380 m. alt., *Heller 12818* (G); edge of forest about Chico Meadows, 1200 m. alt., *Heller 11642* (G); lower end of Donner Lake, *Heller 6888* (G, UC); Donner, 1889, *Brandegee* (UC); Truckee, 1913, *K. Brandegee* (UC); Placer County, 1892, *Carpenter* (UC); Angel Canyon, Calaveras Co., *Davy 1476* (UC); Yosemite Valley, *Torrey 337* (G); Yosemite Valley, *Bolander 6283* (UC); Yosemite Valley, *Hall 9168* (UC); Mariposa Big Tree Grove, 1893, *Eastwood* (UC); Mt. Bullion, 1889, *Congdon* (G); Sherlock's, *Congdon* (G, UC); Agua Fria Mt., 1898, *Congdon* (UC); Bloody Canyon, Mono Co., 1889, *Chestnut & Drew* (UC); Lost Valley, South Fork of San Joaquin River, 2280 m. alt., *Hall & Chandler 650a* in pt. (UC); Natural Bridge of Volcano Creek, 2250 m. alt., *Hall & Babcock 5439* (G, UC); Volcano Creek, *Culbertson 4327* (G); Old Colony Mill, Tulare Co., 1905, *K. Brandegee* (UC); Poso Creek, Greenhorn Range, *Hall & Babcock 5014* (G).

✓ Var. **calistogae**, var. nov., varietatem genuinam simulans differt stylo nuculis subaequilongo vel rare eis longiore.

Vicinity of Calistoga, California, in the southern part of the North Coast Ranges.

CALIFORNIA: bushy hillside near Calistoga, 120 m. alt., *Tracy 1865* (UC); hills east of Calistoga, 240 m. alt., *Tracy 2094* (TYPE, U. C. Herb. no. 175,784); Santa Rosa Creek Canyon, *Baker 620* (UC); ? La Honda, 1890, *Brandegee* (UC).

✓ Var. **pumila** (Heller), comb. nov. Fruiting calyx 2–3.5 mm. long; style shorter than nutlets; plant usually rather conspicuously hispid-hirsute, usually under 2 dm. tall.—*C. pumila* Heller, Muhl. ii. 242 (1906).

Middle Coast Ranges of California from Marin to Santa Clara County.

CALIFORNIA: Mt. Tamalpais, *Heller 8403* (G, ISOTYPE of *C. pumila*); Mt. Tamalpais, 1894, *Eastwood* (G); Tamalpais, 1893, *Brandegee* (UC); in brush at Sugar Loaf Peak, Berkeley Hills, 300 m. alt., *Tracy 2060* (G, UC); in shade, Strawberry Canyon, 150 m. alt., *Tracy 793* and *2054* (UC); wooded slope,

Smith Creek at foot of Mt. Hamilton, *Heller 8588* (G); foothills west of Los Gatos, *Heller 7458* (G, UC); shady hillside, Searsville, *Bolander 39* (G); without locality, *Kellogg & Harford 770* (G).

This species is at once the most widely distributed and the most northerly ranging of all the North American species. It has been generally accepted and well understood, being readily recognized by its erect loosely branched rather slender habit and broadly ovate smooth nutlets. Although it may intergrade with *C. Hendersoni*, possible intergrades are few and the ranges of the two species are such as to suggest specific difference. *Cryptantha Torreyana* differs from *C. Hendersoni* in having much smaller corollas, prevailingly geminate rather than ternate spikes, and always smooth rather than smooth or tuberculate nutlets. Except in California and Alaska *C. Torreyana* occurs in the dryish interior east of the high mounains, whereas *C. Hendersoni*, while occurring east of the mountains, is very common in the moister valleys of western Oregon and Washington.

Piper, Contr. U. S. Nat. Herb. xi. 484 (1906), has given the type locality of *C. Torreyana* as "Grassy hills near San Luis Rey, California," which is a locality quite beyond the known range of the species and in a region in which it is not to be expected. I have been unable to locate in the Gray Herbarium a collection of this species made by Torrey at the locality mentioned. There appear to have been only two of Torrey's collections of this species available to Gray. Gray based his species on a number of specimens and had no "type" in mind. If a type must be selected it seems better to choose either *Torrey 330* from Napa Valley, or preferably *Torrey 337* from Yosemite Valley since the latter is more characteristic of the species.

Most recent botanists, following Gray, have maintained the variety *calycosa*, a variation distinguished by its glomerate spikes and usually elongate calyx-lobes. This variation occurs throughout the range of the species, and although an obvious sort of variety seems to be a trivial one better treated as a mere *forma* or phase of the species worthy of no particular nomenclatorial attention.

In California the typical form of the species pushes southward along the length of the Sierra Nevada, the most southerly undoubted station being in Tulare County. In the herbarium of the University of California there is a specimen of *C. Torreyana* labeled as having been collected by G. F. Reinhardt in the San Jacinto Valley of Riverside County in Southern California. The data accompanying this specimen I doubt, since no other of the numerous collectors visiting the San Jacinto Valley has detected the species, and since the hot plains

and buttes about San Jacinto seem scarcely a likely locality for the southern outpost of a species which over most of its range in California is confined to the mountains and chiefly to the pine belt.

In the Coast Ranges of California the species occurs in its typical form as far south as Lake and Napa counties. Just south of these counties it is replaced by var. *calistogae* and var. *pumila*. Over its extensive range *C. Torreyana* is very constant in having styles evidently shorter than the nutlets. This condition is departed from in the available material from the vicinity of Calistoga, Sonoma County, California; the styles in this material clearly reaching to or slightly beyond the nutlet-tips. To this variation, because of its geographical correlation, the varietal name *calistogae* has been applied. The var. *pumila* is of different character. In the Middle Coast Range the plants representing *C. Torreyana* are more hispid and smaller in all parts. This plant has been confused with *C. leiocarpa* but is quite distinct, for, like the typical *C. Torreyana*, it differs in its broadly ovate nutlets, shorter style, and ebracteate spikes. Macbride, Contr. Gray Herb. n. s. xlviii. 43 (1916), confused the plant with *C. hirsutissima*, a close relative of *C. leiocarpa*. From *C. hirsutissima* the variety differs in its broad nutlets, somewhat shorter style, and different habit. Although the plant was described as a distinct species by Heller it is at most a weak geographical variety of *C. Torreyana* and perhaps not worthy of recognition at all.

39. **C. simulans** Greene. Erect strigose pallid herb with few strictly ascending branches, 1.5–3(–4.5) dm. high; scantily and loosely strigose or below rarely shortly and loosely appressed-hispid; leaves not numerous, oblanceolate or oblance-linear, 2–5(–7.5) cm. long, 2–5(–7) mm. wide, strigose, pustulate (especially the lower ones), frequently extending into the lowermost part of the spikes; cotyledons and early leaves frequently persistent at anthesis; spikes solitary or frequently geminate or ternate, slender, usually elongate and sparsely flowered but at times glomerate; corolla inconspicuous, ca. 2 mm. broad; fruiting calyx 3–8 mm. long, oblong-ovate, slightly asymmetrical, strict or ascending, obscurely biserial, base rounded or broadly conic, pedicels ca. 0.5 mm. long; mature calyx-lobes lance-linear, connivent above with the green tips spreading, midrib slightly thickened and shortly arcuate-hirsute, margins white villous-hispid; nutlets 4, homomorphous, broadly ovate, 2–2.5 mm. long, 1–1.5 mm. broad, densely granulate or granulate-muriculate, sparsely broad-tuberculate, back low-convex, margins rounded, groove broadly forked below and usually closed throughout; gynobase ca. 1–1.5 mm. high; style reaching to about $^{3}/_{4}$–$^{4}/_{5}$ height of nutlets.—Pittonia v. 54 (1902).

In the pine forests from southern Oregon to Southern California, and local in northern Idaho and middle southern Washington.

IDAHO: dry pine woods, Mt. Moscow, *Henderson 2811½* (G). WASHINGTON: open woods, Falcon Valley, *Suksdorf 46* and *595* (G), *181* (UC). OREGON: Klamath Valley, 1260 m. alt., 1864, *Cronkhite* (G); summit of Cascade Mts., along Ashland-Klamath Falls road, *Peck 9264* (G); without locality, 1883, *Howell* (UC). NEVADA: Incline Road, Lake Tahoe, 1890 m. alt., *Kennedy 1446* (UC); Kings Canyon, Ormsby Co., 1700–2000 m. alt., *Baker 1194* (G, UC); Dog Valley Road, 1895, *Hillman* (UC); log railroad north of Verdi, 1590 m. alt., *Heller 10873* (G, UC). CALIFORNIA: in coniferous forests near Sisson, *Heller 8035* (G); Goose Valley, *Eastwood 765* (G); Milford, 1892, *Brandegee* (UC); Prattville, *Heller & Kennedy 8776* (G); Prattville, 1892, *Brandegee* (UC); American River at Strawberry, 1650 m. alt., *Hall 11388* (G); Truckee, *Heller 7060* (G, UC); Placer County, 1892, *Carpenter* (UC); Jackson, 1892, *Hansen* (UC); beneath pines in vicinity of Hog Ranch, Yosemite Park, *Hall & Babcock 3318* and *3444* (UC); Hog Ranch above Hetch-Hetchy, *Congdon 51* (G); Yosemite Valley, 1200–1350 m. alt., *Abrams 4379* (UC) and *4471* (G, UC); Fortman Mt., Mariposa Co., 1885, *Congdon* (UC); Mt. Buckingham, 1898, *Congdon* (UC); Calaveras Big Tree Groove, 1891, *Brandegee* (UC); foothills of Fresno County, 900 m. alt., *Hall & Chandler 56* (UC); Jordan Hot Springs on Nine-mile Creek, 2010 m. alt., *Hall 8393* (UC); Giant Forest, 1905, *Brandegee* (UC); Sequoia Mills, 1892, *Brandegee* (UC); Sportsman Hall, Fyffe P. O., 20 km. above Placerville, *K. Brandegee* (UC); Region of Tehachapi Peak, *Dudley 347* (UC); open pine woods, Mt. Wilson, *Abrams 2578* (G, UC); Swarthout Canyon, 1800 m. alt., 1900, *Hall* (UC); Lytle Creek Canyon, 1725 m. alt., 1899, *Hall* (UC); Lytle Creek Canyon, 1725 m. alt., *Hall 1230* (UC); on dry gravelly canyon-floor, Coldwater Fork of Lytle Creek, 1725 m. alt., *Johnston 2035* (G); dry rocky ground under pines, Icehouse Canyon, 1650 m. alt., *Johnston 2035* (G); San Bernardino Mts., 1800 m. alt., 1899, *Hall* (UC); brushy places, Tahquitz trail above Idyllwild, 2100 m. alt., *Spencer 2117* (G); Onstatt Valley, 1500 m. alt., 1901, *Hall* (UC); Cuyamaca Peak, 1894, *Brandegee* (UC); Southern California, 1880, *Wright 11* (G); southeastern California, 1876, *Parry & Lemmon 279½* (G); Southern California, 1888, *Palmer 41* (G).

This readily recognized species, so characteristic of the Yellow Pine forests of California, has passed as *C. ambigua*, although very different from the low hispid plant of the Northwest properly bearing that name. The pallid strigose pubescence and the broad granulate and tuberculate nutlets readily distinguish it from *C. Torreyana* with which it grows and somewhat approaches in habit.

40. **C. ambigua** (Gray) Greene. Ascending hirsute herb 1–2.5 dm. tall; stems usually loosely branched from the base, hirsute and somewhat short-strigose; leaves narrowly lanceolate to linear, 2–3(–5) cm. long, 1–4(–5) mm. broad, obtuse or subacute, usually somewhat appressed hispid-hirsute, commonly inconspicuously pustulate; spikes usually solitary, 5–15 cm. long, naked or with the lowermost flowers bracted, commonly not projected clear of the leafy mass of the plant and usually not sharply differentiated from the leafy peduncular

branches; corolla inconspicuous, 1–2 mm. broad; fruiting calyces ovate-oblong or oblong, 4–7 mm. long, slightly asymmetrical, spreading, crowded or distant and obscurely biserial, base rounded or broadly conic; pedicels 0.5–0.9 mm. long; mature calyx-lobes linear or lance-linear, usually more or less connivent above, midrib slightly thickened and tawny hirsute, margins evidently short strigose-villous, nutlets 4, broadly ovate, 1.6–2 mm. long, granulate and coarsely tuberculate or very rarely tending to be smooth especially towards base, back low convex, sides obtuse and rounded, groove closed or rarely somewhat dilated but always broadly forked at base; gynobase narrow, 1–1.2 mm. long, ⅔ height of nutlets; style reaching $^4/_5$–$^5/_5$ height of nutlets.—Pittonia i. 113 (1887). *Eritrichium muriculatum*, var. *ambiguum* Gray, Synop. Fl. N. Am. ii. pt. 1, 194 (1878). *Krynitzkia ambigua* Gray, Proc. Am. Acad. xx. 273 (1885). *Eritrichium muriculatum* of Torr. Bot. Wilkes Exped. 416, t. 13 (1874). *C. polycarpa* Greene, Pittonia i. 114 (1887). *C. multicaulis* Nels. Bot. Gaz. xxx. 194 (1900).

Southern Washington to southwestern Montana and thence southward to northern Colorado, extreme western Nevada and northeastern California.

MONTANA: mountains near Indian Creek, *Rydberg & Bessey 4885* (G); Spanish Basin, *Rydberg & Bessey 4886* and *4887* (G); canyon from Rose Hole to Bitterroot Valley, *Watson 286a* (G, UC); Bridger Mts., *Rydberg & Bessey 4889*. WYOMING: on dry loose soil of a road-grade, Snake River, *Nelson 6440* (G, ISOTYPE of *C. multicaulis*); on steep slopes of river-bank, Yellowstone River near Junction Butte, *Nelson 5761a* (G); under granite cliff, Cow Creek, Albany Co., *Nelson 8888* (G); dry loose soil, Centennial, *Nelson 8731* (G). COLORADO: mountain side near Georgetown, 1885, *Patterson* (G). IDAHO: roadside, Bear Creek below Parker Mt., 1800 m. alt., *Macbride & Payson 3305* (G); sagebrush covered hillside, Corral, 1650 m. alt., *Macbride & Payson 2936* (G); abandoned field, Martin, 1800 m. alt., *Macbride & Payson 3044* (G); dry hills, Castle Rock, 1500 m. alt., *Macbride & Payson 2861* (G); Boise, 1892, *Mulford* (G); dry soil, 1650 m. alt., Twilight Gulch, *Macbride 465* (G); loose dry soil, House Creek, *Nelson & Macbride 1773* (G); dry soil, St. Anthony, *Merrill & Wilcox 842* in pt. (G). UTAH: Thistle, 1590 m. alt., *Jones 5370* (UC). NEVADA: upper end of Star Valley near Deeth, 1680 m. alt., *Heller 9074* (G); Franktown, 1500 m. alt., *Heller 9794* (G); Galena Creek, 2400 m. alt., *Kennedy 1293* (UC); Lake Washoe, *Torrey 335* (G); Palisade, 1903, *Stokes* (UC). WASHINGTON: north of Brickleton, *Suksdorf 406* (G); White Salmon, *Suksdorf 594* (G); Klickitat, *Howell 337* (G); Walla Walla Region, 1883, *Brandegee* (UC); Washington Territory, 1883, *Brandegee 994* (G). OREGON: dry ground, Sisters, *Peck 3607* (G); Bend, *Nelson 851* (G, UC); dry slope along Des Chutes River 8 km. below Bend, *Peck 9710* (G); Stein's Mt., *Howell 498* and *499* (G); in sagebrush, Swan Lake Valley, *Applegate 370* (G). CALIFORNIA: Portola, *K. Brandegee* (UC); lake shore, Modoc Co., *Austin & Bruce 2267* (UC); ice pond below Truckee, 1887, *Sonne* (UC, ISOTYPE of *C. polycarpa*).

In the past this species has been greatly confused and the name has been used in a variety of applications. The plant treated here is that figured and described by Torrey in the Botany of the Wilkes Expedition, 416, t. 13 (1874), since Gray appears to have based his *Eritrichium muriculatum*, var. *ambiguum* largely upon Torrey's plate and description. Torrey gives his plant as from Nisqually, but since it represents a species characteristic of the dry interior of Washington it seems likely that, as with other material collected by the Wilkes Expedition, the data had become confused and the plant was probably collected in the Walla Walla Region of southeastern Washington, cf. Piper, Contr. U. S. Nat. Herb. xi. 15 (1906).

Although usually distinguishable by its habit, *C. ambigua* approaches *C. Kelseyana* and *C. Pattersoni* very closely in Idaho and Wyoming, and is occasionally distinguishable from them only with difficulty. Doubtful intermediate plants with homomorphous or subhomomorphous nutlets I have referred to *C. ambigua* even though some so referred have one nutlet subpersistent and occasionally somewhat less tuberculate than the others. Some plants from Idaho referred to *C. ambigua* have nutlets smooth quite like those of *C. Torreyana*. These plants are so referred because their habit is that of *C. ambigua*. *Cryptantha Hendersoni* usually agrees with *C. ambigua* in the size, shape and roughenings of the nutlets, but has a very different habit and inflorescence.

41. **C. echinella** Greene. Usually low and loosely branched hispid herb 5–20 or rarely 40 cm. tall; stems short-hispid, sparsely branched; leaves oblanceolate or oblance-linear, 1–2.5(–4.5) cm. long, 1–4(–6) mm. broad, obtusish, appressed-hispid, minutely pustulate, not numerous; spikes solitary or at times geminate, 1–5 cm. long, slender, commonly leafy-bracted towards base; corolla inconspicuous, 1–1.8 mm. broad; fruiting calyx oblong-ovate, 5–6 mm. long, deciduous, spreading, obscurely biseriate; pedicels 0.1–0.5 mm. long; mature calyx-lobes linear-lanceolate, connivent above and usually recurved, midrib slightly thickened and pale-tawny hirsute, margins appressed short-hispid; nutlets 4, homomorphous, broadly ovate, 2–2.2 mm. long, more or less finely granulate, conspicuously and narrowly papillate, back convex, margin rounded, groove very narrow or closed and widely forked at base; gynobase about ⅔ height of nutlets; style shortly but definitely surpassed by tips of nutlets.—Pittonia i. 115 (1887).

Central Sierra Nevada to the mountains of Southern California and the Charleston Mts. of southern Nevada.

NEVADA: Densmore Camp, Hunte Creek Canyon, 1800 m. alt., *Kennedy 1606* in pt. (UC); Peterson's Ranch near Reno, 1894, *Hillman* (UC); Peavine Foothills, 1895, *Hillman* (UC); Charleston Mts., *Purpus 6077* (UC). CALIFORNIA: Mt. Stanford, 2640 m. alt., 1886, *Sonne* (UC, ISOTYPE); Castle Peak near highest point, *Heller 7079* (G); Tahoe, 1901, *Boring* (UC); Lake Tahoe Region, 1901, *Setchell & Dobie* (UC); Luthers Pass, 2340 m. alt., *Abrams 4759* (G); Yosemite Valley, 1200–1350 m. alt., *Abrams 4379* in pt. (G); dry situations, Yosemite Valley, *Brewer 6284* (UC); Alta Meadows, 1905, *K. Brandegee* (UC); Andrews Camp above Bishop, 1913, *K. Brandegee* (G, UC); sawmill, Mt. Pinos, 2490 m. alt., *Hall 6523* (UC); rocky ground under pines, Prairie Fork of San Gabriel River, 2100 m. alt., *Johnston 2071* (G); on flats, Kelly's Cabin, Ontario Peak, 2460 m. alt., *Johnston 1620* (G, UC); dry ridge east of Ontario Peak, 2520 m. alt., *Munz 6076* (UC); Coldwater Fork of Lytle Creek, 1725 m. alt., *Johnston 2057* in pt. (G); Mare Flat, 2400 m. alt., *Crawford 934* (G); Little Green Valley, 2160 m. alt., *Hall 24* (UC).

This characteristic species has been greatly misunderstood, and repeatedly confused with *C. ambigua* and *C. intermedia*. It grows in dry sunny clearings in the Yellow Pine belt of the California mountains usually in the company of *C. simulans*, *C. affinis* and *C. Torreyana*.

Ser. X. MOHAVENSES. Nutlets 4, smooth, oblong-ovate or lanceolate-ovate or lanceolate, clearly angled at the sides, decidedly homomorphous; style usually equalling height of nutlets or shorter than latter.

Corolla conspicuous; style clearly surpassing the nutlets, these 2–2.5 mm. long.....42. *C. mohavensis.*
Corolla inconspicuous; style about equalling the nutlets in height or a trifle surpassed by them; nutlets 1.2–2 mm. long.....43. *C. Watsoni.*

42. **C. mohavensis** Greene. Ascendingly branched herb 1–4 dm. tall; stems usually freely branched, short-hispid to hispid strigose; leaves linear or lance-linear, 1–4 cm. long, 1–3 mm. broad, appressed-hispid or strigose, minutely and densely pustulate, obtusish, upper ones reduced; spikes ternate or geminate, usually crowded, 2–6 cm. long, naked; corolla conspicuous, 4–7 mm. broad; fruiting calyces oblong-ovate, 3–5 mm. long, ascending, becoming obscurely biserial, symmetrical, base rounded, deciduous, pedicels ca. 0.5 mm. long; mature calyx-lobes lanceolate, connivent above, midrib somewhat thickened and frequently sparsely hirsute, margins usually more or less silky strigose; nutlets 4, homomorphous, smooth and shiny, rarely obscurely granulate, oblong-ovate or lance-ovate, 2–2.5 mm. long, back low-convex or flattish, margins definitely angled especially towards the apex, groove closed above but forked below and opened at the fork to form a small triangular areola; gynobase columnar-subulate, about ¾ height of nutlets; style clearly surpassing tips of

nutlets.—Pittonia i. 120 (1887). *Krynitzkia mohavensis* Greene, Bull. Calif. Acad. Sci. i. 207 (1885).

Southern Sierra Nevada of California, best known from the vicinity of Tehachapi Mountains.

California: Andrews Camp, mountains above Bishop, 1913, *K. Brandegee* (G, UC); sand hills near Pampa Station, *Heller 7642* (G); Water Canyon, Tehachapi Mts., 1800 m. alt., *Abrams & McGregor 474* (G); between Mohave and Cameron, 1905, *K. Brandegee* (UC); Mohave Desert, 1884, *Curran* (G, isotype).

In habit quite similar to *C. oxygona*, and like that species much suggesting *C. muricata* in gross aspect. Although having smooth, wingless nutlets it seems very closely related to *C. oxygona*.

43. **C. Watsoni** (Gray) Greene. Slender strictly branched hispid herb 1–3 dm. high; stems solitary, sparsely to loosely branched, spreading short-hispid; leaves linear to oblanceolate, 1–4(–5) cm. long, 1–4(–5) mm. wide, obtuse or rounded, ascending, hispid and rarely pustulate; spikes solitary or geminate, 1–4(–6) cm. long, occasionally leafy-bracted below; corolla inconspicuous, ca. 1 mm. broad; fruiting calyx ovate or oblong-ovate, 2–3.5(–4) mm. long, subsessile, rounded at base, early deciduous, oldest ones becoming distant; mature calyx-lobes lanceolate, tips usually connivent, midrib hispid and scarcely thickened, margins appressed short-hispid; nutlets 4, homomorphous or practically so, lanceolate, 1.5–2 mm. long, ca. 0.8 mm. broad, smooth, shiny or at times dulled by minute granulations, back nearly flat, margins definitely angled, groove closed or nearly so and forked at base; gynobase subulate, ca. ⅔ height of nutlets; style equalling nutlets or a trifle surpassed by them.—Pittonia i. 120 (1887). *Krynitzkia Watsoni* Gray, Proc. Am. Acad. xx. 271 (1885). *C. vinctens* Nels. & Macbr. Bot. Gaz. lxii. 143 (1916).

Eastern Washington to western Montana, southward to Nevada and northern Colorado.

Montana: Canyon Ferry, 1898, *Brandegee 30* (UC). Wyoming: steep slopes of river banks, Yellowstone River near Junction Butte, *Nelson 5761* (G); Centennial Hills, *Nelson 1684* (G, UC); Point of Rocks, *Nelson 3080* (G, UC); Gorfield Peak, *Nelson 672* in pt. (UC); Rocky Mts., *Nuttall* (G). Colorado: along railroad tracks near Hot Sulphur Springs, Middle Park, 2280 m. alt., *Ramaley & Robbins 3575* (UC). Idaho: loose disturbed soil near road, Challis, 1620 m. alt., *Macbride & Payson 3222* (G); dry granite slopes, Mackay, 1750 m. alt., *Nelson & Macbride 1527* (G, UC); sandy slopes New Plymouth, 660 m. alt., *Macbride 81* (G, UC). Utah: Wasatch Mts., 1800 m. alt., *Watson 858* (G, type of *K. Watsoni*). Nevada: canyon on southwest base of Mt. Grant, 1410 m. alt., *Heller 10905* (G, UC); Mesia near Goldfield, *Heller 10970* in pt. (G, UC); Tonopah, 1800 m. alt., *Shockley 81* (UC). Washington: junction of Crab and Wilson creeks, 390 m. alt., *Sandberg &*

Leiberg 249 (G, UC). OREGON: dry ground, Narrows, *Peck 3587* (G); Juniper Springs, 1350 m. alt., *Leiberg 2271* (G, UC); rocky slopes, Mathew Valley near Harper's Ranch, 1100 m. alt., *Leiberg 2235* (G, TYPE of *C. vinctens*; UC, ISOTYPE); clay banks, Mathew Butte, 750 m. alt., *Leiberg 2041* (G).

An interesting species characterized by its four, lanceolate, angled nutlets and well developed style. Although it has been confused with *C. gracilis* it is really quite distinct from that plant in the angling and number of nutlets, length of style, and shape and pubescence of calyx. *Cryptantha vinctens* is a peculiar form of this species having somewhat appressed-pubescent and inconspicuously hispid calyces. The segregate is not separated geographically, and appears to be merely an extreme form whose characters of pubescence are rather completely obliterated by transitional forms clearly referable to *C. Watsoni*.

Ser. XI. GRACILES. Nutlets 1 or rarely 2, smooth, lanceolate, laterally rounded or obtuse, subhomomorphous, axial one always developing and in general slightly larger than the second nutlet when that develops; style reaching to ⅔–¾ height of nutlet.

44. **C. gracilis** Osterh. Slender erectly branched herb 1–2 dm. high; stems usually solitary, sparsely branched, densely spreading short-hispid; leaves not numerous, linear to narrowly oblanceolate, 1–3 cm. long, 1–3 mm. broad, obtuse or rounded, ascendingly short-hispid, usually minutely pustulate, upper leaves reduced; spikes solitary or geminate, usually dense, 1–2 cm. long, naked; corolla inconspicuous, limb 0.6–1 mm. broad; fruiting calyx ovate, divaricate, 2–2.8 mm. long, promptly deciduous, base decidedly conical, sessile; mature calyx-lobes lanceolate, rather densely appressed tawny hispid-villous, tips erect, midrib slightly thickened and inconspicuously short-hispid; nutlets 1 or rarely 2–3 and then more or less unequally developed, lanceolate, 1.5–2 mm. long, ca. 0.8–1 mm. broad, smooth and shiny, acute, back nearly flat, sides rounded at least towards apex, groove usually opened to above middle and scarcely forked below; gynobase ca. ½ height of nutlet; style reaching to ⅔–¾ height of nutlet.—Bull. Torr. Bot. Cl. xxx. 236 (1903). *C. Hillmanii* Nels. & Kenn. Proc. Biol. Soc. Wash. xix. 157 (1906). *C. gracilis*, var. *Hillmanii* Munz & Johnston, Bull. Torr. Bot. Cl. xlix. 39 (1922).

Southern Idaho and eastern Colorado to northern Arizona and southeastern California.

IDAHO: plains of the Snake River, *Palmer 72* (G, UC); without locality, *Henderson 2561* (G). COLORADO: Glenwood Springs, 1920, *Osterhout* (G); dry mesa among junipers, Nucla, 1800 m. alt., *Payson 395* (G). UTAH:

Gold Hill, 1891, *Jones* (UC); without locality, 1875, *Ward 1231* (G). NEVADA: Palmetto Range, *Purpus 5921* (UC); near Reno, 1894, *Hillman* (UC); Candelaria, *Shockley* (UC); Mesia west of Goldfield, 1860 m. alt., *Heller 10970* (G). ARIZONA: Ash Fork, *Rusby 747* (UC); Grand Canyon, 2100 m. alt., *Mac Dougal 184* (G, UC); Grand Canyon, *Macbride & Payson 947* (G); El Tovar, Grand Canyon, 1907, *Setchell* (UC). CALIFORNIA: near Bonanza King Mine, Providence Mts., *Munz, Johnston & Harwood 4222* (UC); Barnwell, *K. Brandegee* (UC); Silver Canyon near Laws, *K. Brandegee* (UC).

This is a very distinct species and is scarcely to be confused with any other once its characters are understood. The calyx is notably conical at the base, densely covered with short appressed hairs, and apparently lacking pungent hairs on the lobes. One nutlet commonly develops; this is obscurely if at all angled on the edges; and evidently surpasses the style. Occasionally two or even three nutlets are matured, and then they appear to be unequal in length and development. The normal and fully developed nutlet is always near the axial calyx-lobe.

Ser. XII. RAMULOSISSIMAE. Nutlets 4, smooth, lanceolate, laterally rounded or obscurely angled, practically homorphous but with the axial one minutely and obscurely though definitely larger than the others and always present when for any reason less than the normal number develop; style reaching the tips of the nutlets or barely surpassed by them.

45. **C. Fendleri** (Gray) Greene. Herb 1–5 dm. high, usually with a definite straight erect axis (commonly simple below but producing numerous ascending laterals above), more or less densely hispid and frequently appressedly so; leaves narrowly oblanceolate, acute, 2–5 cm. long, 2–4 mm. broad, appressed-hispid, frequently pustulate beneath; spikes solitary or geminate, 2–12 cm. long, sparsely if at all bracteate, loosely flowered; corolla inconspicuous, ca. 1 mm. broad; fruiting calyces ovate-oblong, 4–5(–7) mm. long, ascending, slightly asymmetrical, obscurely biserial; pedicels ca. 0.5 mm. long; mature calyx-lobes linear to lance-linear, usually loosely connivent with the tips somewhat spreading, midrib thickened and hirsute, margins strigose; nutlets homomorphous, 4 (exceptionally with 1–3 aborted, but then the axial nutlet always present), smooth, somewhat shiny, lanceolate, acuminate, 1.5–2 mm. long, back convex, sides rounded or obscurely obtuse, groove closed or nearly so but at base opening into a definite deltoid areola; gynobase subulate, twice length of style, at least ⅔ height of nutlets; style equalling or barely surpassing the nutlets.—Pittonia i. 120 (1887). *Krynitzkia Fendleri* Gray, Proc. Am. Acad. xx. 268 (1885). *Eritrichium hispidum*, var. *leiocarpum*

Kuntze, Rev. Gen. ii. 437 (1891). *C. ramulosissima* Nels. Erythea vii. 68 (1899). *C. wyomingensis* Gandoger, Bull. Soc. Bot. France lxv. 62 (1918).

Southern Alberta and Saskatchewan to eastern Nebraska, northern New Mexico and Arizona; also in eastern Washington and western Nevada.

ALBERTA: Hand Hills, *Macoun 165* (G). SASKATCHEWAN: Crane Lake, *Macoun 5804* (G). WYOMING: sandy dry bottom lands, Dunn's Ranch, *Nelson 7611* (G); sandy plains, Laramie, *Nelson 6886* and *7670* (G); Laramie, *Nelson 5275* (G, UC, ISOTYPES of *C. ramulosissima*); Pine Bluff, *Nelson 3510* (G); Sherman 1878, *Phillips & Sargent* (G); Cummins, *Nelson 1523* (G, UC, ISOTYPE of *C. wyomingensis*). NEBRASKA: sandy prairie, Dismal River south of Thedford, *Rydberg 1429* (G). COLORADO: dry places in Clear Creek Canyon, Georgetown, *Patterson 112* (G, UC); common on plains, Denver, *Eastwood 50* (G, UC); Denver, 1872, *Porter* (G); Rocky Mts., lat. 40°–41°, 1868, *Vasey 434a* (G); Rocky Mts., lat. 39°–41°, 1862, *Hall & Harbour 434* in pt. (G); Colorado Springs, 1873, *Greene* (G, UC); Sierra Mojado, 1877, *Brandegee* (UC); Fort Garland, 1867, *Parry* (G); Salida, *Osterhout 3425* (G); Gunnison, *Baker 780* (G). NEW MEXICO: between Santa Fe and Canoncito, 2190 m. alt., *Heller 3786* (G); without locality, 1847, *Fendler* (G, TYPE of *K. Fendleri*). UTAH: Montezuma Canyon, east of Monticello, *Rydberg & Garrett 9681* (G); sandy soil, La Sal Mts., *Purpus 6610* (UC); below Thurber, *Jones 5648* (UC). ARIZONA: Cosnino, *Rusby 750* (G); openings in yellow-pine forest, east base of San Francisco Mts., 2190 m. alt., 1920, *Hall* (G); Flagstaff, 1894, *Toumey* (UC); San Francisco Mts., 1884, *Lemmon* (UC); sand dunes, Navaho Reservation, *Vorhies 124* (G, UC). WASHINGTON: drifting sand, Pasco, *Piper 2951* (G); without locality, *Henderson 2562* (G). NEVADA: Palisade, *Brandegee* (G).

Cryptantha Fendleri is the most easterly ranging of the smooth-fruited series of *Cryptantha*. In its common typical form the erect habit and paniculate branching are very characteristic, and as a general thing the species has been well understood. A diffusely branched form from southern Wyoming has been described as *C. ramulosissima*. In floral and fruiting structures this form is quite indistinguishable from typical *C. Fendleri*. Similar material has been collected in eastern Washington. The range of *C. Fendleri* seems somewhat discontinuous. Its roots are frequently charged with a purple dye. The three extra-Californian species with narrow, smooth and more or less shiny nutlets may be distinguished as follows,—

Calyx broadly conical at base, densely appressed hispid-villous, lacking conspicuous bristles; nutlets 1; style 2/3–3/4 height of nutlets..... *C. gracilis.*

Calyx rounded at base, hispid or hirsute, inconspicuously strigose along margins; nutlets 4; style about equalling nutlets.

Nutlets evidently angled at the margin; groove closed throughout; leaves obtuse or rounded; plant without a straight vertical axis..... *C. Watsoni.*

Nutlets with margins rounded or somewhat obtusish, groove opened at base to form an areola; leaves acute; plant usually with a stiffly erect straight axis.....*C. Fendleri.*

Ser. XIII. LEIOCARPAE. Nutlets 1–4, smooth, ovate or somewhat lanceolate, laterally rounded or obtuse, homomorphous with the abaxial one always developing; style reaching to ¼ height of nutlets or barely surpassing them; calyx-lobes hirsute with straight hairs.

Style reaching to the tips of the nutlets or barely surpassing them.
Nutlets ovate with a subsimple groove; spikes decidedly bracteate.....46. *C. leiocarpa.*
Nutlets ovate-oblong, usually with a forked groove; spikes naked.....47. *C. hispidissima.*
Style reaching to 1/4–3/4 height of nutlets.
Style reaching to 1/4–1/2 height of nutlets.....48. *C. microstachys.*
Style reaching to 2/3–3/4 height of nutlets.
Hairs on upper part of calyx-lobes conspicuously retrorse. 49. *C. nemaclada.*
Hairs on calyx spreading or ascending.
Spikes naked.....50. *C. Clevelandi.*
Spikes bracted.
Corolla less than 1 mm. broad; diffuse prostrate plants.....51. *C. Brandegei.*
Corolla 1.5–2 mm. broad; sparsely branched erect plants.....52. *C. Abramsii.*

46. **C. leiocarpa** (F. & M.) Greene. Laxly branched usually decumbent or prostrate herb; branches usually long and numerous, hispid-strigose or frequently loosely appressed-hispid, becoming 1–4 dm. long; leaves oblance-linear to oblanceolate, strigose-hispid and often sparsely hispid, occasionally pustulate, obtuse or rounded or rarely emarginate, 1–2.5(–4) cm. long, 1–4(–9) mm. broad; spikes solitary or geminate or rarely ternate, becoming 6 cm. long but usually shorter, conspicuously leafy-bracted, not at all sharply differentiated from the mass of the plant; corolla usually inconspicuous, limb 1–2.5(–3.5) mm. broad; fruiting calyces ovate to oblong-ovate, 2–3 mm. long, usually ascending, tardily deciduous, subsessile, usually crowded or becoming loose below, subsymmetrical; mature calyx-lobes lance-linear, loosely connivent above, midrib somewhat thickened and usually decidedly tawny-hirsute, margins strigose; nutlets 4 or very rarely fewer by abortion, oblong-ovate to ovate, 1.6–2 mm. long, smooth, polished or minutely granulate and dull, back convex, margins obtuse, face convexo-obtuse, groove closed and very shortly forked at base if at all; gynobase subulate, ⅔–¾ height of nutlets; style equalling or slightly surpassing the tips of the nutlets.—Pittonia i. 117 (1887). *Echino-*

spermum leiocarpum F. & M. Ind. Sem. Hort. Petrop. ii. 36 (1835). *Krynitzkia leiocarpa* F. & M. l. c. vii. 52 (1841). *Eritrichium leiocarpum* Wats. Bot. King Exped. 244 (1871).

Along the ocean beach from southern (Curry County) Oregon to (Santa Barbara County) Southern California.

Oregon: beach, Gold Beach, *Peck 8691* (G); beach near Harbor, *Peck 8755* (G); Chetco, *Howell 222* (G). California: sand dunes of ocean beach, Humboldt Bay, *Tracy 2457* (G, UC); Bodega Point, *Eastwood 4815* (G); Bodega Bay, *Heller 5615* (G); Point Reyes, 1886, *Curran* (UC); San Francisco, 1895, *Davy* (UC); Golden Gate Park, San Francisco, 1881, *Jones* (UC); Lake Merced, 1901, *Jones* (UC); Presidio, San Francisco, 1894, *Eastwood* (UC); Monterey, 1883, *Parry* (G); Point Pinos, *K. Brandegee* (UC); Morro, *Barber* (UC); Casmaila Station, *K. Brandegee* (UC); Antonio Station, *K. Brandegee* (UC); Surf, 1909, *K. Brandegee* (G); Surf, 1909, *K. Brandegee a, b, c* (UC).

This is a very well marked coastal species, but has been greatly misinterpreted in the past and at various times made to include nearly all the smooth-fruited species of the genus. Study of material in the Gray Herbarium which was raised from authentic seeds received from St. Petersburg, Hamburg and Geneva, shows clearly that the name should be applied to the sea-shore plant of middle and northern California which has bracteate spikes, long styles, and small ovate smooth nutlets with a simple or barely forked groove. Occasionally it grows with *C. hispidissima* and has been confused with that species, although it is readily separable from it by its bracteate spikes, shorter ovate nutlets, simple or barely forked groove, and commonly smaller corollas. The leaves are usually 1–3 mm. broad, but in some peculiar forms from Surf, Santa Barbara County, California, which apparently grew with the common form, the leaves are broadly oblong, retuse and nearly 10 mm. broad.

47. **C. hispidissima** Greene. Erect and ascendingly branched or loosely branched and somewhat decumbent, 1.5–5 dm. high; stems hirsute or somewhat appressed-hispid; leaves oblance-linear to linear-lanceolate, ascending, 1.5–5.5 cm. long, 1.5–4 mm. wide, obtuse or acute, appressed or frequently spreading-hispid, occasionally hirsute-ciliate; spikes ternate or geminate or rarely quadrinate, dense or remotely flowered, bractless or occasionally with 1–2 bracts near base, 1–8(–15) cm. long; corolla more or less conspicuous or occasionally inconspicuous, 1–5 mm. broad; fruiting calyx ovate-oblong, usually spreading, 2–5 mm. long, slightly asymmetrical, base broad, sessile; mature calyx-lobes lance-linear or almost lanceolate, connivent above with the tips somewhat spreading, margins strigose, midrib thickened and decidedly hirsute; nutlets 4, homomorphous, ovate-lanceolate,

1.5–2 mm. long, smooth or very finely granulate, usually shiny, back convex, sides obtusish, groove simple or forked at very base; gynobase elongata, ca. ⅔ height of nutlets; style reaching to nutlet-tips or definitely surpassing them.—Pittonia i. 118 (1887). *C. leiocarpa*, var. *hispidissima* Macbr. Contr. Gray Herb. n. s. xlviii. 43 (1916).

West of and in the Coast Ranges of California, from San Francisco to Point Conception and doubtfully to near Los Angeles.

California: San Francisco, 1888, *Greene* (G); grassy slopes, Lake Merced, 30 m. alt., *Tracy 1809* (G); Siersville, *Mann* (G); in sand, Gigling Station east of Del Monte, *Heller 6711* (G); Del Monte, *Elmer 3561* (G, UC); Cypress Point, Monterey, *Eastwood 86* (G); Seaside, Monterey, *Eastwood 161* (G); Monterey, 1900, *Eastwood* (G); sand hills beyond Castroville, *Heller 8493* (G); Point Pinos, *K. Brandegee* (UC); Pacific Grove, *Davy 7491* (UC); Gigling Station, 1908, *K. Brandegee* (UC); San Lucia Mts., *Summers 898* (UC); San Lucia Mts., *Summers 589* (UC); Hathaway Hill, 1888, Summers, (UC); Salinas River, 1885, *Curran* (G); Lemmon Ranch, Cholame, 1887, *Lemmon 4606* (G); Cholame, 1887, *Lemmon 4613* (G); Lemmon Ranch, 1887, *Lemmon 4559* (G); Casmaila Station, *K. Brandegee* (UC); Surf, 1909, *K. Brandegee d* (UC); Redondo, 1903, *Grant 5500* (UC).

Obviously related to *C. Clevelandi*, var. *florosa* and perhaps not to be kept specifically distinct, although differing in general range and length of style.

48. **C. microstachys** Greene. Erect slender herb 1–5 dm. high; stems commonly with numerous ascending simple or rebranched laterals, hirsute or rarely more or less strigose; leaves linear, obtuse or rounded, 1–6 mm. long, 1.5–5(–8) mm. broad, broadly sessile or the lower ones with a contracted base, hispid or hirsute, rarely somewhat strigose or pustulate; spikes slender, solitary or geminate, naked, 2–8 cm. long, frequently somewhat crowded towards the end of the stem and apparently paniculate; corolla inconspicuous, usually 0.4–1 mm. or rarely even 2.5 mm. broad; fruiting calyces ovate or oblong-ovate, 1.5–3 mm. but commonly 1.5–2 mm. long, sessile, strict or ascending, asymmetrical with the abaxial lobe the longest and most hirsute; mature calyx-lobes linear or linear-lanceolate, connivent above with the tips somewhat spreading, usually united below to form a short siliceous tube, midrib slightly thickened and divaricately short-hirsute, margins ciliate; ovules 4; nutlets 1 or rarely 2, next the abaxial calyx-lobe, acute-ovate to lanceolate, 1.5 mm. long, smooth and shiny, back and sides rounded, groove closed and simple or forked at very base; gynobase very short, ¼ or less height of nutlet; style about as long as gynobase and commonly attaining about ½ height of nutlet or when two nutlets develop reaching to beyond their middle.—Pittonia i. 116 (1887). *Krynitzkia microstachys* Greene in Gray, Proc. Am. Acad. xx. 269 (1885).

Coast Ranges of middle California and the coastal drainage of Southern California.

CALIFORNIA: gravelly slope east of Alder Springs, Glenn Co., *Heller 11444* (G); Colusa County, 1884, *Curran* (G); Wildcat Canyon, *Davy 7046* (UC); Mt. Diablo, 1886, *Greene* (UC); shelving gravelly slope, Mitchell Canyon, Mt. Diablo, *Baker 2810* (G); Salinas road near Del Monte, *Heller 6698* (G); Lewis Creek, 1893, *Eastwood* (UC); Estrella, *Jared* (UC); San Luis Obispo and Monterey counties, 1899, *Jared 2* (G); Santa Barbara, *Elmer 3797* (G); Painted Cave Ranch, *Eastwood 67a* (G, UC); Santa Inez Mts., 1888, *Brandegee* (UC); Fort Tejon, *Xantus 84* (G, TYPE); Tehachapi, 1889, *Brandegee* (G); at roadside, Topango Canyon, *Crawford & Hiatt 995* (G); Topango, 1898, *Barber* (UC); Eagle Rock Canyon, *Grant 241* (UC); Los Angeles, 1884, *Nevin 57b* and *57c* (G); Pasadena, *Grant 239* (UC); San Gabriel Canyon, *Eastwood 8956* (G); Evey Canyon, 900 m. alt., *Johnston 2019* (G); San Antonio Canyon, *Baker 3698* (G); hills near Claremont, *Baker 4779* and *4780* (G); Arrowhead Hot Springs, 480 m. alt., *Spencer 1305* (G); San Bernardino, *Parish 3645* (G, UC); desert slope of San Jacinto Mts., 1020 m. alt., *Jaeger 1873* (G); burn in chaparral, 8 km. northeast of Murietta, 450 m. alt., *Munz & Johnston 5346* (UC); Linda Vista, *Macbride & Payson 797a* (G); Potrero, *Orcutt 1277* (G); San Diego, 1882, *Pringle* (G); Mission Hills, San Diego, *Abrams 3415* (G).

This species is very closely related to *C. Clevelandi* from which it differs in its coarser habit, shorter style, and usually fewer nutlets. The forms most suggestive of that species come from Southern California and have more or less closely appressed pubescence and calyces becoming 2–3 mm. long. These forms are few, however, most specimens being conspicuously bristly and having calyces only 1.5–2 mm. long.

49. **C. nemaclada** Greene. Slender much-branched erect herb 1–3 dm. tall, minutely and sparsely strigose, finely hispid; leaves linear, rather few, 1–3 mm. long, 1–2 mm. broad, obtuse, somewhat appressed, finely hispid, very minutely pustulate; spikes solitary or geminate, slender, naked, becoming loosely flowered, 2–9 cm. long; corolla inconspicuous, less than 1 mm. broad; fruiting calyx oblong-ovate, strictly ascending, 2–4 mm. long, deciduous, obscurely biserial, subsessile by an obliquely conic base; mature calyx-lobes linear, connivent above with the slender tips spreading, midrib thickened and more or less abundantly hirsute but near the tip retrorsely setulose, margins sparsely strigose; ovules 4; nutlets 1–4, lanceolate to ovate-lanceolate, smooth, 1.7–2 mm. long, back convex, sides obtuse, the one next the abaxial calyx-lobe always developing, groove opened or closed but usually open at the broad forking; gynobase slender, about ½ the length of the nutlets; style reaching to about ¾ the height of the nutlets.—Pittonia i. 118 (1887).

Coast Ranges of California from Tehachapi to Colusa County; rare.

CALIFORNIA: Keene Station, Tehachapi, 1905, *K. Brandegee* (UC); Paso Robles, *K. Brandegee* (UC); Alcalde, 1892, *Brandegee* (UC); Colusa County, 1884, *Curran* (UC, part of TYPE).

The plant is obviously related to *C. Clevelandi* and *C. hispidissima*, and further study may justify the reduction of it to one of the species named. Its outstanding feature is the possession of small stout retrorse hairs on the upper part of the calyx-lobes. The type came from Colusa County in the North Coast Range.

50. **C. Clevelandi** Greene. Usually erect freely branched herb 1–5 dm. tall; stems with long branches, strigose or hirsute; leaves linear to linear-lanceolate, usually acutish, 1–4(–6) cm. long, 1–4 mm broad, hirsute or occasionally strigose, spreading; spikes solitary or geminate or ternate, 4–10 cm. long, naked, slender, usually remotely flowered; corolla inconspicuous or conspicuous, 1–5 mm. broad; fruiting calyces ovate-oblong or nearly ovate, 2–5 mm. long, strict, asymmetrical, deciduous, subsessile by an obliquely conical base; mature calyx-lobes linear or lance-linear, usually decidedly connivent with tips somewhat spreading, midrib thickened and decidedly hirsute, margins densely hispid-ciliate; nutlets 1–4, ovate-oblong to broadly lanceolate, 1.5–2(–2.5) mm. long, smooth, usually very finely granulate, back convex, sides obtuse or rounded, axial nutlet always developing; groove closed, broadly forked at base or rarely with a small areola; gynobase elongate, $\frac{1}{2}$-$\frac{2}{3}$ as high as the nutlets; style reaching to $\frac{2}{3}$-$\frac{4}{5}$ height of nutlets.—Pittonia i. 117 (1887).

Var. **genuina.** Corolla inconspicuous, ca. 1 mm. broad; leaves 1–2(–3) mm. broad; spikes solitary or geminate, not sharply differentiated from leafy mass of plant; nutlets 1–2.—*C. Clevelandi* Greene, l. c.

West of the mountains from the vicinity of Los Angeles southward to northern Lower California.

CALIFORNIA: shaded hillsides, San Jose Hills west of Pomona, 300 m. alt., *Munz & Harwood 3299* (UC); Chollas, 1884, *Orcutt* (UC); San Diego, 1898, *Purpus* (UC); San Diego, 1884, *Brandegee* (UC); San Diego, 1906, *K. Brandegee* (UC); San Diego, 1885, *Greene* (UC, ISOTYPE); Point Loma, 1895, *Brandegee* (UC); Point Loma, 1906, *K. Brandegee* (UC). LOWER CALIFORNIA: Todos Santos Island, 1897, *Brandegee* (UC); All Saints Bay, 1885, *Greene* (UC); Cariso Creek, 1893, *Brandegee* (UC); Vallederos, 1893, *Brandegee* (UC).

Var. **florosa**, var. nov., a varietate genuina differt corolla conspicua 2–5 mm. lata, foliis 1–4 mm. latis, spicis saepe ternatis et supra folia projectis, nuculis 1–4.—*C. Rattani* Greene, Pittonia i. 160 (1887).

In and west of the Coast Ranges of California from San Luis Obispo to San Diego, and infrequent northward to Lake County.

California: ridges west of Leesville, Lake Co., *Heller 13124* (G); rocky slopes, Knoxville, *Baker 2966* (G); above San Antonio, *without collector* (UC); foot of Jolon Grade, *K. Brandegee* (UC); San Lucia Mts., *Summers* (UC); San Lucia Mts., *Summers 598* and *899* (UC); Reservoir, Hathaway Hill, 1884, *Summers* (UC); San Luis Obispo, 1905, *Roadhouse 54* (UC); San Luis Obispo, 1911, *Condit* (UC); Chorro Station near San Luis Obispo, *K. Brandegee* (UC); steep hills near Lompoc, *Suksdorf 220* and *7757* (G); Gaviota, *K. Brandegee* (UC); near Frazier Borax Mine, Mt. Pinos, *Abrams & McGregor 211* (G); Sisquoc, *Baker 22* (UC); Tehachapi, *K. Brandegee* (UC); Painted Cave Ranch, *Eastwood 31* (UC); San Miguel Island, 1886, *Greene* (UC); Santa Cruz Island, 1908, *Niedenmuller* (UC); Santa Cruz Island, 1888, *Brandegee* (UC); Santa Barbara, *Elmer 3936* (G); Santa Barbara, *Brewer 278* (UC); Santa Inez Mts., 1888, *Brandegee* (UC); Saugus, 1901, *Davy* (UC); South Beach, 1898, *Barber* (UC); Santa Monica Canyon, *Barber 116* (UC); Playa del Rey, *Hall 3780* (G, UC); San Pedro, 1889, *K. Brandegee* (UC); Santa Catalina Island, 1889, *Brandegee* (UC); grassy hillsides, Turnbull Canyon, Puente Hills, *Johnston 1935* (G); shaded hillside, Laguna, *Munz 2214* (G); roadside, Linda Vista, *Macbride & Payson 797* (G, TYPE); San Diego, 1906, *K. Brandegee* (UC).

This species includes almost all the material from South California passing as *C. leiocarpa*. It is related on one hand to *C. hispidissima* and on the other to *C. microstachys*, apparently intergrading with both. In having a very short style, elongate nutlets and bractless spikes, it differs from *C. leiocarpa*. Doubtfully included in the species are several collections from the North Coast Ranges.

51. **C. Brandegei** Johnston. Much branched decumbent or prostrate herb; stems numerous, slender, hispid-strigose, 1–4 dm. long; leaves oblong-lanceolate or lanceolate, spreading, 5–15 mm. long, 2–3(–4) mm. broad, obtuse or acute, hispid-strigose and often sparsely hispid, minutely pustulate; spikes solitary or occasionally geminate, 2–8 cm. long, dense or loose and elongate, slender, more or less evidently leafy-bracted; corolla inconspicuous, less than 1 mm. broad; fruiting calyx ovate-oblong, 2–4 mm. long, strictly ascending, asymmetrical, becoming obscurely biserial, sessile; mature calyx-lobes lance-linear, usually connivent above with the tips spreading, midrib thickened and hirsute, margins strigose; nutlets 1–4, ovate-lanceolate, 1.5–2 mm. long, smooth or very minutely granulate, usually shiny, back convex, sides rounded, face flattened, groove closed with a well developed basal fork; gynobase subulate, about $\frac{1}{2}$–$\frac{2}{3}$ height of nutlets; style reaching to $\frac{2}{3}$–$\frac{4}{5}$ height of nutlets.—Contr. Gray Herb. n. s. lxviii. 53 (1923)

Known only from Santa Rosa off the coast of California.

California: Santa Rosa Island, 1888, *Brandegee* (G, TYPE; UC, ISOTYPE).

In habit much suggesting *C. leiocarpa* but differing in its more elongate nutlets, widely forked groove, short style and more southern insular range. It is much more closely related to, and perhaps it is

only a phase of, *C. Clevelandi* with which it agrees in nutlets although differing in its longer style and bracteate inflorescence. *Cryptantha Clevelandi*, var. *florosa* occurs on Santa Cruz and San Miguel islands which are adjacent to Santa Rosa Island.

52. **C. Abramsii** Johnston. Erectly and sparsely branched herb 1–3 dm. high; stem slender, finely strigose; leaves linear, rather numerous, 1–3 cm. long, 1–1.5 mm. broad, acutish, hispid-strigose, usually sparsely hirsute-ciliate towards the base; spikes solitary or rarely geminate, 2–10 cm. long, evidently leafy-bracted; corolla evident, 1.5–2.5 mm. broad; fruiting calyx ovate, strict, 2.5–4 mm. long, asymmetrical, becoming distant and obscurely biserial, sessile by an oblique broadly conic base; mature calyx-lobes lance-linear, loosely connivent, midrib somewhat thickened and on abaxial lobe sparsely and very shortly hirsute, margins strigose; nutlets 1–4, lanceolate, acuminate, ca. 2 mm. long, smooth, shiny, back convex, sides obscurely obtuse, groove closed and broadly forked at very base of nutlet; gynobase narrow, about ⅔ height of nutlets; style reaching to $^3/_4$–$^4/_5$ height of nutlets.—Contr. Gray Herb. n. s. lxviii. 52 (1923).

Southern California, known only from the type locality.

California: San Pedro Hills near Malaga Cove, *Abrams 3139* (G, type; UC, isotype).

Although suggesting *C. leiocarpa* in its bracteate inflorescence, this species differs in its shorter style and elongate nutlets with a broad decidedly basal forking of the groove. It is most related to *C. Clevelandi*, var. *florosa* and possibly is only a bracteate phase of it.

Ser. XIV. FLACCIDAE. Nutlet 1, smooth, somewhat ovate, laterally rounded or obscurely angled, always abaxial; style reaching to ¼–⅔ height of nutlet; calyx-lobes armed with pallid encrusted arcuate or uncinate hairs.

Style reaching to 1/2-2/3 height of nutlet; nutlet with an open areola; rather coarse plants.....53. *C. rostellata*.
Style reaching to less than 1/2 height of nutlet; nutlet with a closed groove; more slender plants.
Nutlets nearly terete, rostrate; hairs on calyx usually decidedly encrusted and pale.....54. *C. flaccida*.
Nutlets evidently compressed, acute; hairs on calyx rather smooth and less pale.....55. *C. sparsiflora*.

53. **C. rostellata** Greene. Stems stiffish, usually somewhat reddish, 1–2 dm. high, with few ascending branches above, strigose, canescent; leaves few, notably persistent and opposite, thickish, firm, oblanceolate, 10–15 mm. long, 2–3 mm. broad, ascending; spikes

solitary or geminate, stiffish, naked, 2–4 cm. long; corolla inconspicuous, 0.5–1 mm. broad; fruiting calyces 3–4 mm. long, oblong-ovate, spreading or ascending (not strict), coarse, rather few, subpersistent, subsessile by a very asymmetrical base; mature calyx-lobes lanceolate, margin sparsely ciliate or strigose, midrib on all lobes armed with stout encrusted uncinate or arcuate hairs; ovules 4, the one next the abaxial calyx-lobe alone developing; nutlets 1, smooth, compressed, ovate-lanceolate to lanceolate, 2–3 mm. long, back convex, sides rounded, base truncate; groove closed above but dilated below into a definite areola; gynobase very short and stout; style reaching up to ⅓–½ height of nutlet.—Pittonia i. 116 (1887). *Krynitzkia rostellata* Greene, Bull. Calif. Acad. Sci. i. 203 (1885). *K. Suksdorfii* Greenm. Bot. Gaz. xl. 146 (1905). *C. Suksdorfii* Piper, Contr. U. S. Nat. Herb. xi. 484 (1906).

Southern Washington (Klickitat County) southward through eastern Oregon to the Sacramento Valley of California.

WASHINGTON: on dry hills near Rockland, *Suksdorf 1495* (G, TYPE of *K. Suksdorfii;* UC, ISOTYPE). OREGON: on dry hills near Dalles City, *Suksdorf 2346* (G, UC); camp by Grizzly Butte, Crook Co., 1170 m. alt., *Leiberg 282* (G, UC). CALIFORNIA: Hornbrook, 1889, *Howell* (UC); Hornbrook, *Howell 1386* (UC); Leesburg, 1884, *Curran* (UC, "part of type"); near Chico, 1887, *Parry* (UC); Lake County, 1884, *Curran* (G).

Obviously related to *C. flaccida* but readily separated by its usually coarse habit, longer style, compressed nutlets and basally dilated groove. The type is given as having been collected in "Lake County," California. Specimens in the University of California Herbarium, given as from "Leesburg," a town in Colusa County, California, are labeled as "part of type." This material, to judge from general appearance, seems quite the same as the authentic specimen of *C. rostellata* contained in the Gray Herbarium and probably is part of the same collection.

54. **C. flaccida** (Dougl.) Greene. Subsimple or ascendingly branched pallid strigose herb 1.5–4.5 dm. high; stems sparsely close-strigose with short pallid encrusted hairs; leaves oblance-linear or linear or even filiform, 2–6 cm. long, 1–2(–3) mm. wide, closely strigose, strict or ascending, firm, basal portion of lower leaves somewhat persistent; spikes quinate to solitary, naked, usually stiffish, 4–8(–16) cm. long; corolla inconspicuous or medium sized, 1–4 mm. broad; fruiting calyces oblong-ovate, 2–4(–5) mm. long, evidently asymmetrical, usually strict and closely hugging the stem, commonly firm and stiff, sessile or subsessile, base broadly conic; mature calyx-lobes lance-linear, closely connivent above with the tips commonly spread-

ing, margins more or less ciliate or strigose, midrib thickened and armed with pale spreading coarse encrusted arcuate or uncinate bristles, abaxial lobe longest and most hirsute; ovules 4 but only the one next the abaxial calyx-lobe developing; nutlet 1, lance-ovate, rostrate-acuminate, subterete or only slightly compressed, smooth or very finely granulate; groove closed and frequently with the margins overlapping, rarely open particularly towards the base where dilated to form a small areola; gynobase low and stout, scarcely developed, 0.6–0.2 mm. tall; style $\frac{1}{3}$–$\frac{1}{2}$ as high as nutlet.—Pittonia i. 116 (1887). *Myosotis flaccida* Dougl. in Lehm. Pugil. ii. 22 (1830). *Eritrichium oxycaryum* Gray, Proc. Am. Acad. x. 58 (1874). *Krynitzkia oxycarya* Gray, Proc. Am. Acad. xx. 269 (1885). *C. multicaule* Howell, Fl. N. W. Amer. i. 487 (1901); not Nels. (1900). *C. Howellii* Nels. Bot. Gaz xxxiv. 30 (1902).

Washington and Idaho to Southern California.

Washington: Coulee City, *Piper 3887* (G); junction of Crab and Wilson creeks, 450 m. alt., *Sandberg & Leiberg 304* (G, UC); near Sprague, 540 m. alt., *Sandberg & Leiberg* 173 (G, UC); Almota, *Piper 1702* (G); Walla Walla, 1883, *Brandegee* (UC); Waitsburg, *Horner 1170* (G). Oregon: along Des Chutes River at Sherar's Bridge, *Howell 502* (G, isotype and photograph of type of *C. multicaulis*); Rhea Creek, 390 m. alt., *Leiberg 54* (G, UC); camp at Grizzly Butte, 1170 m. alt., *Leiberg 283* (G, UC); crevices of rocks, Tone, 1903, *Lunell 16* (G); bank of Hood River, 1883, *Henderson* (G); railroad track, Tonquin, *Nelson 3096* (G); dry stubble-field pastured to sheep, 1.6 km. north of Salem, *Nelson 4893* (G); dry bank, 1.6 km. north of Salem, *Nelson 2222* (G); dry slope near Illahe, *Nelson 1377* (G). Idaho: valley of Clearwater River, *Sandberg, MacDougal & Heller 163* (G); about Lewiston, *Heller 3068* (UC); sandy flats, Falk's Store, 660 m. alt., *Macbride 36* (G); loamy sagebrush flat, Regena, 750 m. alt., *Macbride & Payson 2842* (G); Boise, 1881, *Canby* (G); without locality, 1892, *Mulford* (G). California: dry land near Yreka, *Butler 734* and *1298* (UC); Yreka, *Smith 211* (G); Ager, 1887, *K. Brandegee* (UC); Edgewood, 1887, *Brandegee* (UC); Hy-Am-Pum, 1888, *Chestnut & Drew* (UC); Iqua, 1882, *Rattan 19* (G); Hupa Indian Reservation, 150 m. alt., *Chandler 1304* (G); dry hillside at little Van Duzen Bridge, 750 m. alt., *Tracy 2758* (UC); dry hillside at Alder Point Bridge on Eel River, 150 m. alt., *Tracy 1880* (UC); along ridge above Hopland, *Baker 3003* (G); Potter Valley, 1898, *Purpus* (UC); sunny hillsides, Potter Valley, *Purpus 1294* (UC); near Madison, *Heller & Brown 5410* (G); Russian River bed at Cloverdale, *Bolander 6541* (G, UC); between Cloverdale and Ukiah, *Bolander 8896* (UC); Leesville, 1889, *Brandegee* (UC); Cloverdale, 1890, *K. Brandegee* (UC); Howell Mt., 360 m. alt., *Tracy 439* (UC); Colusa County, 1884, *Curran* (G); Tiburon, *Eastwood 306* (G); Lower Pleasant Valley, *1891, Jepson* (UC); Sacramento Valley, *Hartweg 1872* (G); near mouth of Little Grizzly Creek below Genessee, *Heller & Kennedy 8853* (G); stony bank, 13 km. north of Oroville, *Heller 11325* (G, UC); Little Chico Canyon, 1896, *Austin 624* (UC); Little Chico, 1883, *Austin* (UC); Kelsey, 1889, *Brandegee* (UC); Sweetwater Creek, 1907, *K. Brandegee* (UC); The Buttes, 1891, *Jepson* (UC); Jackson, 390 m. alt., *Hansen 152* (G, UC); Pine Grove, 750 m. alt., *Hansen 450* (G); York Falls, 600 m. alt., *Hansen 431* (G, UC); Knight's Ferry, 1854, *Bigelow* (G); Mokelumne Hill, *Plaisdell* (G); Harmon Peak, *Davy 1420* (UC); Agua

Fria, 1897, *Congdon 44* (G); Beckwell Adobe, 1897, *Congdon 45* (G, UC); Yosemite Valley, *Bolander 6386* (G, UC); Yosemite, 1875, *McLean* (UC); Yosemite Valley, 1200–1350 m. alt., *Abrams 4560* (G); Wawona, *Lemmon* (UC); Borax Lake, *Torrey 329* and *333* (G); Madera, *Buckminster* (UC); Tehipite Valley, 1200 m. alt., *Hall & Chandler 505* (UC); Toll House, Fresno County, 1215 m. alt., *Hall & Chandler 32* (UC); Dunlap, 1893, *Eastwood* (UC); hillsides, North Tule River, *Purpus 5692* (UC); near Old Colony Mill, Giant Forest, 1905, *K. Brandegee* (UC); Portersville, *Donnelly 25* (UC); Camp Badger, 1892, *Holway 6* (UC); sunny gravelly slopes, Bear Creek, *Purpus 1707*; grassy fields, Caliente, *Heller 7625* (G); Caliente, 1892, *Brandegee* (UC); Tehachapi, 1889, *Brandegee* (UC); Keane, 510 m. alt., *Jones* (UC); north of Mt. Diablo, *Brewer 1129* (G); along banks and roadsides, Crystal Springs Lake, *Baker 468* (G, UC); Mt. Hamilton, *Elmer 5038* (UC); between Brick Yard and Licks Observatory, 1110 m. alt., *Pendleton 907* (UC); along Mt. Hamilton road, 22.5 km. from San Jose, *Heller 7437* (G, UC); Coyote, *Chandler 937* (UC); Lewis Creek, 1893, *Eastwood* (UC); Jolon, *Brandegee* (UC); without locality, 1899, *Jarea 1* (G); Lancaster, *K. Brandegee* (UC); Saugus, 1889, *Brandegee* (UC); Los Angeles, 1884, [*Nevin?*] *57g* (G); grassy mesa, Red Hill, 330 m. alt., *Johnston 1941* (G); dry ridges near Cuyamaca Lake, *Abrams 3824* (G); Colorado Desert, 1905, *Brandegee* (UC); without locality, *Blake* (G).

One of the best known species in the genus, readily recognized by its pallid strigose pubescence, stout arcuate bristles on the calyx-lobes, very short style and solitary terete ovate and rostrate nutlet. The type was collected by Douglas probably in eastern Oregon or Washington.

55. **C. sparsiflora** Greene. Very slender, sparingly and ascendingly branched sparsely strigose herb 1–3 dm. tall; cotyledons somewhat persistent, ovate to orbicular, 2.5 mm. broad, contracted to a petiole 2 mm. long; leaves few, narrowly linear, 1–3 cm. long, ca. 1 mm. broad, strigose, herbaceous, noticeably opposite below; spikes geminate or solitary, 2–6 cm. long, slender, not stiff, with 1–2 bracts near very base; corolla inconspicuous, less than 1 mm. broad; fruiting calyces 2–3 mm. long, ovate or oblong-ovate, ascending, few, early deciduous, subsessile by a very asymmetrical broadly conic base; mature calyx-lobes linear-lanceolate, united for ½–¼ length of calyx, loosely connivent, margins sparsely ciliate, midrib slightly thickened, armed with short stout smoothish uncinate hairs; ovules 4, the one next the abaxial calyx-lobe alone developing; nutlet 1, ovate, acute (scarcely if at all acuminate), decidedly compressed, smooth or finely granulate, 2 mm. long, equalled or somewhat surpassed by calyx-lobes, base somewhat truncate, back convex, margins angled, groove closed and broadly forking near the base; gynobase low; style attaining ⅓–½ height of nutlet.—Pittonia i. 116 (1887). *Krynitzkia sparsiflora* Greene, Bull. Calif. Acad. Sci. i. 203 (1885).

Slopes surrounding the Sacramento and San Joaquin valleys of California.

California: Lake County, 1884, *Curran* (G, UC); Coburn Mills, 1892, *Brandegee* (UC); Mormon Bar, Mariposa Co., 1889, *Congdon* (G); Whitlocks, 1897, *Congdon* (G); Havilah, 1891, *Brandegee* (UC).

Although having broad nutlets suggestive of *C. Torreyana*, this species is clearly related to *C. flaccida* as shown by its somewhat encrusted strigose pubescence, single abaxial nutlet, and falcate or uncinate bristles on the calyx-lobe. The plant is characterized by its broad nutlets, very slender habit, and short uncinate bristles on the calyx. The type of the species was collected by Curran somewhere in northern California, probably in Lake or Colusa counties.

Ser. XV. AFFINES. Nutlets 1 or 4, smooth, ovate, laterally rounded, asymmetrical with an excentric groove and an irregular areola, when single always abaxial; style reaching ¼–⅔ height of nutlets.

Nutlets 4; style reaching at least to 2/3 height of nutlets; flowers in biseriate spikes; plant erect.....56. *C. affinis.*
Nutlet solitary; style not reaching to middle of nutlet; flowers axillary; plant spreading.....57. *C. glomeriflora.*

56. **C. affinis** (Gray) Greene. Usually sparsely branched herb 1–2(–4) dm. high; branches commonly few and ascending but plant occasionally much branched from the base, hispid or short-hirsute throughout; leaves narrowly to broadly oblanceolate, 1–4(–5) cm. long, 2.5–6(–8) mm. broad, few, short-hirsute, usually minutely pustulate, obtuse or rounded at tip, lowest pair clearly opposite; spikes geminate or solitary, usually 2–8 but becoming 15 mm. long, slender, remotely flowered, commonly with a very few large leafy bracts below; corolla inconspicuous, 1–2 mm. long, limb ca. 1.5 mm. broad; fruiting calyx 2.5–4 mm. long, usually about as broad as long, laterally compressed, ascending; pedicels 0.5–1 mm. long; mature calyx-lobes lanceolate, somewhat connivent, not greatly surpassing the nutlets, midrib weakly thickened and on the abaxial lobe sparsely hirsute, margins appressed-hispid; nutlets 4, homomorphous, smooth or very finely granulate, shiny, brownish to greenish, frequently mottled, 1.8–2.5 mm. long, ovate, obliquely compressed, back low-convex, margins rounded; groove evidently excentric, closed, simple or shortly and unequally forked at the base; gynobase short, stout, ca. $^1_2$ height of nutlets; style evidently surpassed by nutlets or rarely equalling them.—Pittonia i. 119 (1887); Macbr. Contr. Gray Herb. n. s. xlviii. 46 (1916). *Krynitzkia affinis* Gray, Proc. Am. Acad. xx. 270 (1885). *C. geminata* Greene, l. c. *C. confusa* Rydb. Bull. Torr. Bot. Cl. xxxvi. 679 (1909).

Washington and western Montana to Southern California, northern Nevada and southern Wyoming.

WASHINGTON: Falcon Valley, *Suksdorf 455* (G); open pine wood, Falcon Valley, *Suksdorf 179* and *3207* (UC); valley of Swauk River, *Sharples 195* and *197* (G); Kamiach Butte, *Piper 3092* (G); dry rocky hillsides, Blue Mts., 1897, *Horner* (G); dry low ground northwest of Chenowith, *Suksdorf 2768* (UC); east side of Cascades, 1860, *Lyall* (G, TYPE of *K. affinis*). OREGON: dry slopes along Ashland-Klamath Falls road, 19 km. west of Keno, *Peck 9313* (G); without locality, *Howell 371* (G). IDAHO: Beaver Canyon, *Watson 286* (G); Payette Lake, 1899, *Jones* (UC). MONTANA: Priests, 1894, *Brandegee 98* (UC). WYOMING: Upper Madison Canyon, Yellowstone Park, 2200 m. alt., *Rydberg & Bessey 4884* (G, ISOTYPE of *C. confusa*). UTAH: City Creek Canyon near Salt Lake City, *Jones 269* (G) and *107* (UC). NEVADA: log railroad north of Verdi, 1590 m. alt., *Heller 10873* in pt. (G). CALIFORNIA: near Shasta Springs, *Heller 7962* (G); moist open places near Durney's Mill, north base of Mt. Eddy, *Heller 13287* (G, UC); Metcalf's Ranch, northeast base of Mt. Eddy, 1170 m. alt., *Heller 12397* (G); Goose Valley, *Eastwood 737* (G); Susanville, 1891, *Brandegee* (UC); meadows 3 km. south of Red Clover Valley, *Heller & Kennedy 8729* (G); Prattville, 1892, *Brandegee* (UC); Prattville, *Heller & Kennedy 8777* (G); edge of forest about Chico Meadows, 1200 m. alt., *Heller 11489* (G, UC); Sutton House, Butte Co., *Curran* (UC); in gravel on edge of north slope, Little Summit, *Heller 11487* (G, UC); moist soil along lake shore with aspen, Donner Lake, *Hall 6946* (G); near Donner Lake, *Torrey 331* (G); Strong's Canyon near Truckee, 1884, *Curran* (G); Old Camp on Truckee, *Sonne* (UC); Truckee, 1885, *Curran* (UC); lower end of Donner Lake, *Heller 6946* (G); Cobb Mt., Lake Co., *C. F. L.* (UC); near summit of Mt. Sanhedrin, Lake Co., *Heller 5882* (G); near Cape Horn, *K. Brandegee* (UC); Cathedral Trail to Mt. Tallac, 2100 m. alt., *Smiley 219* (G); Sly Park in sierran foothills of El Dorado Co., 1020 m. alt., *Hall 11276* (G, UC); Lake Valley, 1908, *K. Brandegee* (UC); Silver Lake, 1882, *Hansen* (UC); Bear Valley, Calaveras Co., 1800 m. alt., *Hansen 516* (G, UC); Yosemite Valley, *Abrams 4379* (G); Indian Creek, Yosemite Park, 2190 m. alt., *Hall 9172* (G); Vernal Falls, Yosemite Park, *Hall 8925* (UC); summit of Mt. Surprise, 1890, *Congdon 326* (UC); North Fork of San Joaquin, Madera Co., 1895, *Congdon* (G, UC); South Fork of San Joaquin River, Lost Valley, 2280 m. alt., *Hall & Chandler 650a* in pt. (UC); Hockett Meadows, 2550 m. alt., *Hall & Babcock 5632* (UC); Ellis Meadows, 1914, *K. Brandegee* (G); Sequoia National Forest, *Davidson 1820* (G); Sequoia Mills, 1892, *Eastwood* (UC); General Grant Big Tree Grove, 1892, *Brandegee* (UC); Natural Bridge of Volcano Creek, 2250 m. alt., *Hall & Babcock 5439* (G); dryish edge of meadow, Mare Flats, San Bernardino Mts., 2400 m. alt., *Crawford 934* in pt. (G); Middle Peak, Cuyamaca Mts., *Abrams 3856* (G); Southern California, 1888, *Palmer 183* (G).

Especially characteristic of this plant are its obliquely compressed nutlets and the resulting excentric position of the groove. The nutlets appear to be compressed by a force perpendicular to the axial and abaxial faces of the stout gynobase. Greene, l. c., has remarked on this development as exemplified in the type of the synonymous *C. geminata*.

57. **C. glomeriflora** Greene. Small very slender herb 1–8(–10) cm. high; stems simple or with more or less numerous ascending re-

branched basal branches, finely and very appressedly short-hispid or rarely somewhat spreadingly hispid; leaves linear-oblong to oblanceolate or lanceolate, 5–10 mm. long, 0.8–1.3 mm. broad, appressed short-hispid, minutely pustulate; flowers axillary, frequently borne along short branchlets and glomerate, distributed over nearly all parts of the plant; corolla inconspicuous, tubular and just surpassing the calyx, 1.3–1.8 mm. long, ca. 1 mm. broad, lobes broadly orbicular and erect, appendages trapeziform; fruiting calyx obovate, 2–2.5 mm. long, ascending, asymmetrical, united for ⅓–½ its length, base conical and somewhat siliceous, sessile, deciduous, not at all biserial; mature calyx-lobes lanceolate, erect or slightly connivent, midrib thickened and hirsute especially on abaxial lobe, margin short-hispid or hispid-strigose; ovules 4; nutlet 1, ovate, acute, 1.5–2 mm. long, next the abaxial calyx-lobe, asymmetrical, persistent, smooth and shiny, usually greenish, just surpassing or about equalling the axial calyx-lobes, back and sides rounded, face somewhat flattened; groove slightly off-center, closed except just above very base of nutlet where opening abruptly into an irregular roughened areola; gynobase very reduced, ca. 1/10 height of nutlet; style very short, not much surpassing the aborted nutlets, surpassed by the mature nutlet by over 1 mm.
—Pittonia i. 116 (1887).

Central Sierra Nevada of California. Rare.

CALIFORNIA: borders of ice-ponds below Truckee, 1887, *Sonne* (UC, ISOTYPE); dry gravelly pine forest, Tuolumne Meadows, 2600 m. alt., *Ware 2690c* (G); Volcano Creek, Upper Kern River, 2400 m. alt., *Hall & Babcock 5322* (UC).

A very rare and distinct species with a habit recalling *Plagiobothrys* § *Allocarya*. It is very well marked in having asymmetrical solitary nutlets that about equal the calyx-lobes, and in having decidedly axillary glomerate flowers with no suggestion of a biserial arrangement. The nutlets are suprabasal in attachment.

EXCLUDED OR UNIDENTIFIED SPECIES.

CRYPTANTHA BARTOLOMAEI Greene, Pittonia ii. 232 (1892). "Aspect, pubescence and inflorescence of *C. utahensis*, but the minute (½ line long) ovate-lanceolate nutlets (4 and consimilar) perfectly smooth and lucid, and without margin; the ventral groove shortly bifurcate at base, but closed throughout. Bay of San Bartolomé, Lower California, Lieut. Pond, 1889. A connecting link between the *oxygona* and *leiocarpa* groups in the genus."—The identity of this species is wholly obscure.

CRYPTANTHA FALLAX Greene, Pittonia v. 54 (1902). "With much the aspect of a slender *C. muriculata*, less than a foot high, the branches with scattered oblong-linear obtuse foliage and terminating in 3 divergent short and rather dense spikes; stem sparsely villous-hirsute, the foliage as sparingly somewhat strigose, the calyxes with a dense pubescence under the rather few very hispid spreading hairs: calyx-segments lanceolate, short, the tips not attenuate; corolla minute; nutlets ovate-lanceolate from a truncate base, traversed ventrally by a closed scar, this shortly forked at base, the whole surface grayish, smooth and shining, the back but slightly convex and distinctly sharp-edged. A very remarkable species in the almost wing-margined character of the smooth nutlets; for the plant has the aspect of that group of species whose nutlets are obtuse all around, and muricate. The only specimen known was collected by myself in the mountains above Tehachapi, California, 22 June, 1889, and was mixed with my duplicates of *C. muriculata* until now."—Perhaps conspecific with *C. mohavēnsis*.

Cryptantha heliotropoides Loes. in Fedde, Repert. xii. 243 (1913) = ANTIPHYTUM HELIOTROPIOIDES A. DC. Prodr. x. 122 (1846).

Cryptantha Torreyi Rydb. Mem. N. Y. Bot. Gard. i. 331 (1900).—Although taken up in place of *C. Torreyana* (Gray) Greene, this name is based on *Eritrichium Torreyi* Gray and so falls into the synonymy of PLAGIOBOTHRYS TORREYI Gray, Proc. Am. Acad. xx. 284 (1885).

Krynitzkia californica Gray, Proc. Am. Acad. xx. 266 (1885) = PLAGIOBOTHRYS TRACHYCARPUS (Gray) Johnston, Contr. Gray Herb. n. s. lxviii. 78 (1923).

Krynitzkia californica, var. *subglochidiata* Gray, Proc. Am. Acad. xx. 266 (1885) = PLAGIOBOTHRYS SCOPULORUM (Greene) Johnston, Contr. Gray Herb. n. s. lxviii. 79 (1923).

Krynitzkia Chorisiana Gray, Proc. Am. Acad. xx. 267 (1885) = PLAGIOBOTHRYS CHORISIANUS (Cham.) Johnston, Contr. Gray Herb. n. s. lxviii. 77 (1923).

Krynitzkia Cooperi Gray, Proc. Am. Acad. xx. 267 (1885) = PLAGIOBOTHRYS PARISHII Johnston, Contr. Gray Herb. n. s. lxviii. 78 (1923).

Krynitzkia depressa Jones, Contr. W. Bot. xiii. 5 (1910) = OREOCARYA DEPRESSA (Jones) Macbr. Contr. Gray Herb. n. s. xlviii. 32 (1916).

Krynitzkia echinoides Jones, Proc. Calif. Acad. Sci. ser. 2, v. 709 (1895) = OREOCARYA ECHINOIDES (Jones) Macbr., i. e. plant treated by Macbride, Contr. Gray Herb. n. s. xlviii. 36 (1916), as *O. fulvocanescens*.

Krynitzkia floribunda Gray, Proc. Am. Acad. xx. 265 (1885) = ANTIPHYTUM FLORIBUNDUM (Torr.) Gray, Proc. Am. Acad. x. 55 (1875).

Krynitzkia fulvocanescens Gray, Proc. Am. Acad. xx. 280 (1885) = OREOCARYA FULVOCANESCENS (Gray) Greene, i. e. *O. echinoides* of Macbride, Contr. Gray Herb. n. s. xlviii. 31 (1916)

Krynitzkia fulvocanescens, var. *idahoensis* Jones, Contr. W. Bot. xiii. 6 (1910) = OREOCARYA sp.

Krynitzkia glomerata Gray, Proc. Am. Acad. xx. 279 (1885) = OREOCARYA GLOMERATA (Pursh) Greene, Pittonia i. 58 (1887).

Krynitzkia glomerata, var. *acuta* Jones, Zoe ii. 250 (1891) = OREOCARYA WETHERILLII Eastw. Bull. Torr. Bot. Cl. xxx. 242 (1903).

Krynitzkia glomerata, var. *virginensis* Jones, Contr. W. Bot. xiii. 5 (1910) = OREOCARYA VIRGINENSIS (Jones) Macbr. Proc. Am. Acad. li. 547 (1916).

Krynitzkia heliotropioides Gray, Proc. Am. Acad. xx. 265 (1885) = ANTIPHYTUM HELIOTROPIOIDES A. DC. Prodr. x. 122 (1846).

Krynitzkia Jamesii Gray, Proc. Am. Acad. xx. 278 (1885) = OREOCARYA SUFFRUTICOSA (Torr.) Greene, Pittonia i. 57 (1887).

Krynitzkia Kingii Wats. acc. Hillman, Nevada Agric. Exper. Sta., Bull. xxiv. 71 (1895) = PLAGIOBOTHRYS KINGII (Wats.) Gray, Proc. Am. Acad. xx. 281 (1885).

Krynitzkia leucophaea Gray, Proc. Am. Acad. xx. 280 (1885) = OREOCARYA LEUCOPHAEA (Dougl.) Greene, Pittonia i. 58 (1887).

Krynitzkia leucophaea, var. *alata* Jones, Proc. Calif. Acad. Sci. ser. 2, v. 710 (1895) = OREOCARYA CONFERTIFLORA Greene, Pittonia iii. 112 (1896).

Krynitzkia lithocarya Greene in Gray, Proc. Am. Acad. xx. 265 (1885) = PLAGIOBOTHRYS LITHOCARYUS (Greene) Johnston, Contr. Gray Herb. n. s. lxviii. 76 (1923).

Krynitzkia mensana Jones, Contr. W. Bot. xiii. 4 (1910) = OREOCARYA EULOPHUS Rydb. Bull. Torr. Bot. Cl. xxxi. 637 (1905).

Krynitzkia mollis Gray, Proc. Am. Acad. xx. 267 (1885) = PLAGIOBOTHRYS MOLLIS (Gray) Johnston, Contr. Gray Herb. n. s. lxviii. 74 (1923).

Krynitzkia multicaulis, var. *abortiva* Jones, Contr. W. Bot. xiii. 5 (1910) = OREOCARYA SUFFRUTICOSA, var. ABORTIVA (Jones) Macbr. Proc. Am. Acad. li. 547 (1916).

Krynitzkia multicaulis, var. *setosa* Jones, Contr. W. Bot. xiii. 4 (1910) = OREOCARYA sp.

Krynitzkia oblata Jones, Contr. W. Bot. xiii. 4 (1910) = OREOCARYA OBLATA (Jones) Macbr. Proc. Am. Acad. li. 548 (1916).

Krynitzkia Palmeri Gray, Proc. Am. Acad. xx. 278 (1885) = OREOCARYA PALMERI (Gray) Greene, Pittonia i. 57 (1887).

Krynitzkia Parryi Gray, Proc. Am. Acad. xx. 265 (1885) = ANTIPHYTUM PARRYI Wats. Proc. Am. Acad. xviii. 122 (1883).

Krynitzkia peninsularis Rose, Contr. U. S. Nat. Herb. i. 85 (1890) = ANTIPHYTUM PENINSULARE (Rose) Johnston, Contr. Gray Herb. n. s. lxviii. 51 (1923).

Krynitzkia plebeia Gray, Proc. Am. Acad. xx. 266 (1885) = PLAGIOBOTHRYS PLEBEJUS (Cham.) Johnston, Contr. Gray Herb. n. s. lxviii. 77 (1923).

Krynitzkia pustulata Blankinship, Mont. Agric. Coll. Sci. Studies, Bot. i. 96 (1905) = OREOCARYA AFFINIS Greene, Pittonia iii. 110 (1896).

Krynitzkia Scouleri Gray, Proc. Am. Acad. xx. 267 (1885) = PLAGIOBOTHRYS SCOULERI (H. & A.) Johnston, Contr. Gray Herb. n. s lxviii. 75 (1923).

Krynitzkia sericea Gray, Proc. Am. Acad. xx. 279 (1885) = OREOCARYA SERICEA (Gray) Greene, Pittonia i. 58 (1887).

Krynitzkia sericea, var. *fulvocanescens* Jones, Proc. Calif. Acad. Sci. ser. 2, v. 710 (1895) = OREOCARYA FULVOCANESCENS (Gray) Greene, Pittonia i. 58 (1887).

Krynitzkia setosissima Gray, Proc. Am. Acad. xx. 276 (1885) = OREOCARYA SETOSISSIMA (Gray) Greene, Pittonia i. 58 (1887).

Krynitzkia trachycarpa Gray, Proc. Am. Acad. xx. 266 (1885) = PLAGIOBOTHRYS TRACHYCARPUS (Gray) Johnston, Contr. Gray Herb. n. s. lxviii. 78 (1923).

Krynitzkia virgata Gray, Proc. Am. Acad. xx. 279 (1885) = OREOCARYA VIRGATA (Porter) Greene, Pittonia i. 58 (1887).

PIPTOCALYX MOOREI Oliver in Benth. Fl. Austral. v. 292 (1870).—A shrubby Australian plant belonging to the *Monimiaceae*, cf. Perkins & Gilg, Pflanzenr. iv. Fam. 101, 22–23 (1901).

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Bolander, H. N. 39 Torreyana v. pumila (38c); 3896 flaccida (54); 3916, 6283 Torreyana v. genuina (38a); 6541 flaccida (54).

Brandegee, E. N. 26 Kelseyana (22); 30 Watsoni (43); 36 Kelseyana (22).

Brandegee, K. 157 nevadensis v. genuina (30a); 158 dumetorum (14).

Brandegee, T. S. 406 minima (23); 995 pterocarya v. genuina (19a); 1622 micromeres (15); 1646 muricata v. Jonesii (32b).

Brewer, W. H. 232 muricata v. genuina (32a); 278 Clevelandi v. florosa (50b); 1129 flaccida (54); 6284 echinella (41).

Butler, G. D. 733 Hendersoni (36); 734 flaccida (54); 762 Torreyana v. genuina (38a); 1298 flaccida (54); 1310 Torreyana v. genuina (38a); 1416 Hendersoni (36).

Chandler, H. P. 937 flaccida (54); 1302 Hendersoni (36); 1303 Torreyana v. genuina (38a); 1304 flaccida (54); 5355 muricata v. Jonesii (32b).

Clark, J. A. 165 Torreyana v. genuina (38a).

Clements, F. E., & Clements, E. S. 106 intermedia (28); 108 muricata v. Jonesii (32b).

Cleveland, D. 301, 302, 303, 304, intermedia (28).

Clifton, R. L. 3083, 3139 minima (23).

Congdon, J. W. 40, 41 muricata v. Jonesii (32b); 42 micromeres (15); 44, 45 flaccida (54); 50 Hendersoni (36); 51 simulans (39); 52 muricata v. Jonesii (32b); C59 mariposae (33); 326 affinis (56).

Copeland, E. B. 3481 Torreyana v. genuina (38a); 3550 Hendersoni (36).

Coulter, T. 500 angustifolia (8).

Coville, F. V., & Funston, F. 479 angustifolia (8); 480 maritima v. pilosa (16c); 700 nevadensis v. genuina (30a); 713 recurvata (12); 714 utahensis (17); 720 pterocarya v. cycloptera (19b).

Crawford, D. 934 echinella and affinis (41 and 56).

Crawford, D., & Hiatt, O. 257 intermedia (28); 326 muricata v. genuina (32a); 995 microstachys (48).

Culbertson, J. D. 4240 circumscissa v. hispida (10b); 4327 Torreyana v. genuina (38a); 4537 Hendersoni (36).

Cusick, W. C. 1913 Torreyana v. genuina (38a); 2020a micrantha v. genuina (7a).

Davidson, A. 174a barbigera (29); 501a crassisepala (24); 1820 affinis (56); 2698 pterocarya v. genuina (19a); 2700 circumscissa v. hispida (10b).

Davy, J. B. 1420 flaccida (54); 1476 Torreyana v. genuina (38a); 1567, 1622 intermedia (28); 1648 muricata v. genuina (32a); 1875, 2291, 2306 nevadensis v. rigida (30b); 7046 microstachys (48); 7491 hispidissima (47); 8007 holoptera (1).

Davy, J. B., & Blasdale, W. C. 5730 Torreyana v. genuina (38a).

Dudley, W. R. 347 simulans (39).

Eastwood, A. 10 intermedia (28); 31 Clevelandi v. florosa (50b); 50 Fendleri (45); 66 micromeres (15); 66a muricata v. genuina (32a); 67 intermedia (28); 67a microstachys (48); 86, 161 hispidissima (47); 162 micromeres (15); 306 flaccida (54); 622, 689 Torreyana v. genuina (38a); 737 affinis (56); 765 simulans (39); 802 Torreyana v. genuina (38a); 1366 intermedia (28); 1894 Torreyana v. genuina (38a); 2518 micromeres (15); 2591a micrantha v. lepida (7b); 3632 angustifolia (8); 2704 racemosa (2); 2710 barbigera (29); 2937 intermedia (28); 4815 leiocarpa (46); 8401 crassisepala (24); 8936 microstachys (48); 8948 intermedia (28).

Elmer, A. D. E. 3561 hispidissima (47); 3682 micrantha v. genuina (7a); 3705 circumscissa v. genuina (10a); 3716 pterocarya v. genuina (19a); 3797 microstachys (48); 3866 intermedia (28); 3936 Clevelandi v. florosa (50b); 5038 flaccida (54).

Fendler, A. 640 crassisepala (24).

Ferguson, M. E. 42 intermedia (28).

Garrett, A. O. 1869 Torreyana v. genuina (38a).

Giard. 65 pusilla (5).

Goldman, E. A. 308 Grayi v. cryptochaeta (9c).

Goodding, L. N. 197, 234 Kelseyana (22); 828 utahensis (17); 889 barbigera (29); 974 pterocarya v. genuina (19a); 1068 Torreyana v. genuina (38a); 1176 Kelseyana (22); 2144 micrantha v. genuina (7a); 2165 utahensis (17); 2165 nevadensis v. genuina (30b) and pterocarya v. genuina (19a); 2169, 2181 angustifolia (8); 2201 nevadensis v. genuina (30a); 2202 pterocarya v. genuina (19a); 2203 micrantha v. genuina (7a); 2227 pterocarya v. cycloptera (19b); 2252 utahensis (17); 2264 pusilla (5); 2273 crassisepala (24); 2381 racemosa (2); 2395 albida (11).

Grant, G. B. 238 muricata v. genuina (32a); 241 microstachys (48); 242 intermedia (28); 5500 hispidissima (47).

Greene, E. L. 301 minima (23); 1111 pterocarya v. cycloptera (19b); 1112 micrantha v. genuina (7a).

Gregg, J. 32 albida (11).

Hall, E. 469 texana (21).

Hall, E., & Harbour, J. P. 433, 434 minima (23); 434 Fendleri (45).

Hall, G. R. 12 muricata v. denticulata (32c); 24 echinella (41).

Hall, H. M. 399, 1161 intermedia (28); 1161 oxygona (18); 1230 simulans (39); 2052 muricata v. Jonesii (32b); 2180 intermedia (28); 2839 pterocarya v. cycloptera (19b); 2849 oxygona (18); 2991 intermedia (28); 3780 Clevelandi v. florosa (50b); 3883 intermedia (28); 5786 holoptera (1); 5788 holoptera (1); 5856 barbigera (29); 5922 angustifolia (8); 5974 costata (6); 6523 echinella (41); 6540 micrantha v. lepida (7b); 7408 decipiens v. corollata (25b); 8393 simulans (39); 8925 affinis (56); 8940 muricata v. Jonesii (32b); 9168 Torreyana v. genuina (38a); 9172, 11276 affinis (56); 11388 simulans (39); 11391 affinis (56).

Hall, H. M., & Babcock, E. B. 3318, 3444 simulans (39); 5014 nevadensis v. rigida (30b); 5014 Torreyana v. genuina (38a); 5132 Hendersoni (36); 5322 glomeriflora (57); 5439 Torreyana v. genuina (38a); 5632 affinis (56).

Hall, H. M., & Chandler, H. P. 32 flaccida (54); 56 simulans (39); 505 flaccida (54); 650a Torreyana v. genuina and affinis (38a and 56); 680 maritima v. pilosa (16c); 6803 pterocarya v. genuina (19a); 6807a pterocarya v. cycloptera (19b); 6925 inaequata (4); 7034 racemosa (2); 7038 nevadensis v. genuina (30a).

Hall, H. M., & Hall, G. R. 8394 Hendersoni (36).

Hansen, G. 152, 430, 431 flaccida (54); 516 affinis (56).

Hanson, H. C. 402 crassisepala (24).

Hartman, C. 612 crassisepala (24).

Hartweg, T. 157 albida (11); 1872 flaccida (54).

Havard, V. 46 albida (11).

Heller, A. A. 5615 leiocarpa (46); 5882 affinis (56); 6587 intermedia (28); 6698 micromeres and microstachys (15 and 48); 6711 hispidissima (47); 6888 Torreyana v. genuina (38a); 6946 affinis (56); 7060 simulans (39); 7079 echinella (41); 7341 micromeres (15); 7437 flaccida (54); 7458 Torreyana v. pumila (38c); 7491 muricata v. Jonesii (32b); 7625 flaccida (54); 7642 mohavensis (42); 7645 nevadensis v. rigida (30b); 7764 circumscissa v. genuina (10a); 7668 pterocarya v. genuina (19a); 7788 nevadensis v. rigida (30b); 7789 oxygona (18); 7883 intermedia (28); 7962 affinis (56); 7995 Torreyana v. genuina (38a); 8035 simulans (39); 8203 nevadensis v. genuina (30a); 8205 pterocarya v. genuina (19a); 8209 racemosa (2); 8221 recurvata (12); 8235 circumscissa v. genuina (10a); 8270 barbigera (29); 8275, 8365 pterocarya v. genuina (19a); 8403 Torreyana v. pumila (38c); 8493 hispidissima (47); 8588 Torreyana v. pumila (38c); 9074 ambigua (40); 9632 decipiens v. genuina (25a); 9657 nevadensis v. genuina (30a); 9794 ambigua (40); 10112 Henderscni (36); 10439 angustifolia (8); 10446, 10447 racemosa (2); 10873 simulans and affinis (39 and 56); 10877 circumscissa v. genuina (10a); 10905 Watsoni (43); 10970 Watsoni and gracilis (43 and 44); 10971 pterocarya v. genuina (19a); 10976 angustifolia (8); 11325 flaccida (54); 11368 intermedia (28); 11444 microstachys (48); 11450 Torreyana v. genuina (38a); 11449, 11450 muricata v. Jonesii (32b); 11461 intermedia (28); 11487, 11489 affinis (56); 11642, 11912 Torreyana v. genuina (38a); 11928 Hendersoni (36); 12372 Torreyana v. genuina (38a); 12397 affinis (56); 12259, 12818 Torreyana v. genuina (38a); 12886 muricata v. denticulata (32c); 13021 intermedia (28); 13124 Clevelandi v. florosa (50b); 13287 affinis (56).

Heller, A. A., & Brown, H. E. 5410 flaccida (54); 5510 intermedia (28).

Heller, A. A. & E. G. 2998 Hendersoni (36); 3068 flaccida (54); 3255

Torreyana v. genuina (38a); 3786 Fendleri (45).

Heller, A. A., & Kennedy, P. B. 8718 Torreyana v. genuina (38a); 8729 affinis (56); 8773 Torreyana v. genuina (38a); 8776 simulans (39); 8777 affinis (56); 8853 flaccida (54).

Henderson, L. F. 2561 gracilis (44); 2562 Fendleri (45); 2811 Hendersoni (36) and Torreyana v. genuina (38a); 2811½ simulans (39); 4815 Hendersoni (36); 4877 Torreyana v. genuina (38a).

Hitchcock, A. S. 346 minima (23).

Holway, E. W. D. 6 flaccida (54).

Horner, R. M. 380 Torreyana v. genuina (38a).

Howell, J., & Howell, T. 337, ambigua (40).

Howell, T. 222 leiocarpa (46); 371 affinis (56); 498, 499 ambigua (40); 500, 501 Hendersoni (36); 502 flaccida (54); 1386 rostellata (53).

Hubby, R. W. 20, 21 decipiens v. corollata (25b); 22 intermedia (28); 23, 24 muricata v. genuina (32a).

Jaeger, E. 1846 circumscissa v. genuina (10a); 1873 microstachys (48).

Jared, L. 2 microstachys (48).

Johnston, E. L., & Hedgcock, G. G. 509 minima (23).

Johnston, I. M. 27r micrantha v. genuina (7a); 1002 racemosa (2); 1053 barbigera (29); 1542, 1598 muricata v. denticulata (32c); 1620 echinella (41); 1886 muricata v. Jonesii (32b); 1934 intermedia (28); 1935 Clevelandi v. florosa (50b); 1938 intermedia (28); 1941 flaccida (54); 1948 intermedia (28); 1950 muricata v. denticulata (32c); 1957 intermedia (28); 1958 muricata v. Jonesii (32b); 1959, 1960 intermedia (28); 2019 microstachys (48); 2035 simulans (39); 2048a muricata v. Jonesii (32b); 2046, 2047, 2048, 2049 intermedia (28); 2057 simulans and echinella (39 and 41); 2071 echinella (41); 2073 muricata v. denticulata (32c); 3071 Grayi v. cryptochaeta (9c); 3175, 3374, 3505, 3621 racemosa (2); 3947 Grayi v. nesiotica (9b); 4192 racemosa (2); 4221 angelica (3); 4227 angustifolia (8); 6494 pterocarya v. genuina (19a).

Jones, M. E. 26 muricata v. denticulata (32c); 2810 muricata v. Jonesii (32b); 3709 crassisepala (24); 3741 pusilla (5); 3753 pterocarya v. cycloptera (19b); 3824 maritima v. genuina (16a); 3841 costata (6); 3910 utahensis (17); 5106 barbigera (29); 5370 ambigua (40); 5648 Fendleri (45); 6838 Torreyana v. genuina (38a); 7028 muricata v. denticulata (32c).

Jones, W. W. 106 micrantha v. genuina (7a); 342 nevadensis v. rigida (30b).

Kellogg, A., & Harford, W. G. 770 Torreyana v. pumila (38c).

Kennedy, P. B. 952 muricata v. denticulata (32c); 998 pterocarya v. genuina (19a); 1293 ambigua (40); 1345 pterocarya v. genuina (19a); 1428 Torreyana v. genuina (38a); 1446 simulans (39); 1606 echinella (41); 1832 micrantha v. genuina (7a); 1838 decipiens v. genuina (25a); 1917 muricata v. denticulata (32c).

Kennedy, P. B., & Goodding, L. N. 24 pterocarya v. cycloptera (19b); 26 angustifolia (8); 74 dumetorum (14).

Kreager, F. O. 93 Torreyana v. genuina (38a).

Leiberg, J. B. 41 pterocarya v. genuina (19a); 54 flaccida (54); 116 Hendersoni (36); 282 rostellata (53); 283 flaccida (54); 324 circumscissa v. genuina (10a); 1539 Torreyana v. genuina (38a); 2041 pterocarya v. genuina (19a); 2041, 2235, 2271 Watsoni (43); 2362 Hendersoni (36); 2425 recurvata (12); 2465 Hendersoni (36).

Lemmon, J. G. 4559, 4606, 4613 hispidissima (47).

Lunell, J. 16 flaccida (54).

Macbride, J. F. 29 circumscissa v. genuina (10a); 36 flaccida (54); 81 Watsoni (43); 109 Hendersoni (36); 373 Torreyana v. genuina

(38a); 465 ambigua (40); 786 circumscissa v. genuina (10a); 1690 Torreyana v. genuina (38a).

Macbride, J. F., & Payson, E. B. 689 crassisepala (24); 735, 748 intermedia (28); 797 Clevelandi v. florosa (50b); 797a microstachys (48); 947 gracilis (44); 2842 flaccida (54); 2861, 2936, 3044 ambigua (40); 3221 scoparia (31); 3222 Watsoni (43); 3305 ambigua (40).

MacDougal, D. T. 184 gracilis (44).

Macoun, J. 165 Fendleri (45); 672 intermedia (28); 5803 Kelseyana and minima (22 and 23;) 5804 Fendleri (45).

Macoun, J. M. 66580, 78736 Torreyana v. genuina (38a).

Manning, M. H. 160 Torreyana v. genuina (38a).

Mathews, W. 40 crassisepala (24).

Merrill, E. D., & Wilcox, E. N. 873 circumscissa v. genuina (10a); 842 Torreyana v. genuina and ambigua (38a and 40).

Metcalfe, O. B. 52 crassisepala (24); 1573 pterocarya v. cycloptera (19b).

Munz, P. A. 2214 Clevelandi v. florosa (50b); 5784 intermedia (28); 6076 echinella (41).

Munz, P. A., & Harwood, R. D. 3299 Clevelandi v. genuina (50a); 3472 intermedia (28); 3587, 3601a costata (6).

Munz, P. A., & Johnston, I. M. 5176 nevadensis v. genuina (30a); 5317 intermedia (28); 5346 microstachys (48).

Munz, P. A., Johnston, I. M., & Harwood, R. D. 4222 gracilis (44); 4241 utahensis (17); 4281 barbigera (29).

Munz, P. A., & Keck, D. 4755 maritima v. genuina (16a); 4757 barbigera (29); 4763 angustifolia (8).

Nelson, A. 304 minima (23); 412, 672 Kelseyana (22); 672 Watsoni (43); 1335 Kelseyana (22); 1523 Fendleri (45); 1684, 3080 Watsoni (43); 3171 Kelseyana (22); 3510 Fendleri (45); 4683 scoparia (31); 5275 Fendleri (45); 7280 Kelseyana (22); 7611 Fendleri (45); 8731, 8888 ambigua (40); 8897, 9049, 9377a, 9415 Kelseyana (22).

Nelson, A., & Macbride, J. F. 1215 Torreyana v. genuina (38a); 1311 scoparia (31); 1527 Watsoni (43); 1703 scoparia (31); 1739 pterocarya v. genuina (19a); 1773 ambigua (40); 1801 scoparia (31); 2151 Torreyana v. genuina (38a); 2231 scoparia (31).

Nelson, A., & Nelson, E. 5761 Watsoni (43); 5761a ambigua (40); 5887 Pattersoni (20); 6224 Torreyana v. genuina (38a); 6440 ambigua (40); 6546 Torreyana v. genuina (38a); 6886, 7670 Fendleri (45).

Nelson, E. 851 ambigua (40); 859 circumscissa v. genuina (10a).

Nelson, E. W. 6343 albida (11).

Nelson, J. C. 1254, 1369 Hendersoni (36); 1377 flaccida (54); 1414, 2083, 2109, 2166 Hendersoni (36); 2222 flaccida (54); 3093 Hendersoni (36); 3096 flaccida (54); 3253, 4869 Hendersoni (36); 4893 flaccida (54).

Nevin, J. C. 57a flaccida (54); 57b, 57c microstachys (48).

Orcutt, C. R. 15 echinosepala (13); 27, 52, 80 Grayi v. genuina (9a); 1022, 1127 muricata v. Jonesii (32b); 1277 microstachys (48); 1278 intermedia (28); 1279 nevadensis v. genuina (30a); 1281 muricata v. Jonesii (32b); 2257 maritima v. genuina (16a); 2264 barbigera (29).

Osterhout, G. 3425 Fendleri (45); 3464 Kelseyana (22); 3464, 3559b Pattersoni (20); 6188 Kelseyana (22).

Palmer, E. 26 echinosepala (13); 28 pusilla (5); 41 simulans (39); 65 pusilla (5); 67 maritima v. genuina (16a); 68 foliosa (27); 72 gracilis (44); 139 pusilla (5); 150 decipiens v. genuina (25a); 169 angustifolia (8); 183 affinis (56); 188 racemosa (2); 204 scoparia (31); 227 pusilla and albida (5 and 11); 241 angustifolia (8); 242 echinosepala (13); 243 albida (11); 257 intermedia (28); 343

albida (11); 346 pterocarya v. cycloptera (19b); 348 barbigera (29); 350 nevadensis v. genuina (30a); 352 utahensis (17); 371 micrantha v. genuina (7a); 372 circumscissa v. genuina (10a); 376 muricata v. genuina (32a); 397 Grayi v. cryptochaeta (9c); 551 maritima v. pilosa (16c); 606 angustifolia (8); 608 intermedia (28); 691 maritima v. cedrosensis (16b); 695 intermedia (28); 780 barbigera (29); 781 maritima v. genuina (16a); 801 Grayi v. genuina (9a); 842 foliosa (27); 846 racemosa (2); 877 foliosa (27); 879 maritima v. genuina (16a); 896 albida (11); 912 maritima v. genuina (16a); 2046 albida (11); 2142 maritima v. pilosa (16c).

Pammel, L. H., & Blackwood, R. 3895 Torreyana v. genuina (38a).

Parish, S. B. 3337 racemosa (2); 3645 microstachys (48); 3660 intermedia (28); 4850 nevadensis v. genuina (30a); 6940 intermedia (28); 8124 angustifolia (8); 8429 costata (6); 9798 maritima v. pilosa (16c); 9810 dumetorum (14); 9855 holoptera (1); 9859 inaequata (4); 9869 barbigera (29); 10005, 10050 maritima v. pilosa (16c); 10125 racemosa (2); 10138 pterocarya v. genuina (19a); 10238 pterocarya v. genuina (19a); 11117 intermedia (28); 11118 muricata v. Jonesii (32b); 11154 intermedia (28); 11299 intermedia (28).

Parish, S. B., & Parish, W. F. 771 micrantha v. genuina (7a); 771a micrantha v. lepida (7b); 775 racemosa (2); 929 intermedia and muricata v. Jonesii (28 and 32b); 1215 intermedia (28).

Parish, W. F. 167 pterocarya v. cycloptera (19b).

Parry, C. C. 14,164 micrantha v. genuina (7a); 165 circumscissa v. genuina (10a); 171 barbigera (29).

Parry, C. C., & Lemmon, J. G. 279½ simulans (39).

Parry, C. C., & Palmer, E. 623 albida (11).

Patterson, H. N. 111 Kelseyana and minima (22 and 23); 112 Fendleri (45).

Payson, E. B. 296 minima (23). 395 gracilis (44).

Payson, E. B., & Armstrong, G. M. 3324, 3392 Torreyana v. genuina (38a).

Payson, E. B., & Payson, L. B. 1756 Torreyana v. genuina (38a); 2535 Kelseyana (22); 2546 Pattersoni (20); 2628 Torreyana v. genuina (38a).

Peck, M. E. 1369½, 1416 Torreyana v. genuina (38a); 3587 Watsoni (43); 3607 ambigua (40); 3609 Torreyana v. genuina (38a); 3995 Hendersoni (36); 6108 circumscissa v. genuina (10a); 8473 Hendersoni (36); 8691, 8755 leiocarpa (46); 9264 simulans (39); 9295 Torreyana v. genuina (38a); 9313 affinis (56); 9447 Torreyana v. genuina (38a); 9709 circumscissa v. genuina (10a); 9710 ambigua (40).

Pendleton, R. L. 907 flaccida (54).

Piper, C. V. 295 Fendleri (45); 372 Hendersoni (36); 1702 flaccida (54); 1941, 1944 Hendersoni (36); 1945 Torreyana v. genuina (38a); 2961 pterocarya v. genuina (19a); 2966 circumscissa v. genuina (10a); 3091 Torreyana v. genuina (38a); 3092 affinis (56); 3887 flaccida (54); 4140 Torreyana v. genuina (38a); 5030 scoparia (31); 5044 Torreyana v. genuina (38a); 5018, 5043, 5105, 5106, Hendersoni (36).

Pond, C. F. 21 maritima v. genuina (16a).

Pringle, C. G. 184 pusilla (5); 6648, 8301 albida (11).

Purpus, C. A. 126 albida (11); 1294, 1707 flaccida (54); 2402 albida (11); 5304 circumscissa v. hispida and circumscissa v. genuina (10a, b); 5369 oxygona (18); 5433 utahensis (17); 5692 flaccida (54); 5712 circumscissa v. genuina (10a); 5825 pterocarya v. cycloptera (19b); 5825a oxygona (18); 5841 circumscissa v. genuina (10a); 5856 recurvata (12); 5897 oxygona (18); 5921 gracilis (44); 5986 utahensis and pterocarya v. genuina (17 and 19a); 6024 racemosa (2); 6077 echinella (41); 6488 recurvata (12); 6610 Fendleri (45).

Rattan, V. 6 micromeres (15); 19 flaccida (54); 42 Torreyana v. genuina (38a); 43 intermedia (28).
Ramaley, T., & Robbins, W. W. 3575 Watsoni (43).
Reverchon, J. 2120 minima (23).
Roadhouse, F. E. 54 Clevelandi v. florosa (50b).
Robinson, O. W., & Crocker, H. 998 intermedia (28).
Rothrock, J. F. 88 intermedia (28).
Rydberg, P. A., & Bessey, E. A. 4885, 4886, 4887, 4889 ambigua (40).
Rydberg, P. A., & Garrett, A. O. 9681 Fendleri (45).
Rydberg, P. A., & Vreeland, F. K. 5697 minima (23).
Rusby, H. H. 285 barbigera (29); 745 micrantha v. genuina (7a); 747 gracilis (44); 750 Fendleri (45).

Sandberg, J. H., & Leiberg, J. B. 121 Torreyana v. genuina (38a); 173 flaccida (54); 228 circumscissa v. genuina (10a); 248 Watsoni (43); 260 pterocarya v. genuina (19a); 304 flaccida (54).
Sandberg, J. H., MacDougal, D. T., & Heller, A. A. 163 flaccida (54); 351 Torreyana v. genuina (38a).
Schaffner, J. G. 731 albida (11).
Seaton, H. E. 173 albida (11).
Seler, E., & Seler, C. 5304 albida (11).
Sharples, S. P. 195, 197 affinis (56).
Sheldon, E. P. S10866 Hendersoni (36).
Shockley, W. H. 69 utahensis (17); 81 Watsoni (43); 260 recurvata (12); 282 pterocarya v. genuina (19a); 288 nevadensis v. genuina (30a); 347, 650 utahensis (17).
Smart. 126 barbigera (29); 132 pterocarya v. cycloptera (19b); 141 crassisepala (24).
Smiley, F. J. 219 affinis (56); 820 circumscissa v. genuina (10a).
Smith, L. E. 211 flaccida (54).
Spencer, M. F. 36, 37 intermedia (28); 38 muricata v. Jonesii (32b); 184 nevadensis v. genuina (30a); 187 barbigera (29); 188 nevadensis v. genuina (30a); 189 barbigera (29); 190 pterocarya v. cycloptera (19b); 191 barbigera (29); 194 micrantha v. genuina (7a); 195a, 198 maritima v. genuina (16a); 195, 196, 197 angustifolia (8); 200 pterocarya v. cycloptera (19b); 200a barbigera (29); 201 angustifolia (8); 254 racemosa (2); 290, 294 intermedia (28); 345 muricata v. Jonesii (32b); 387 circumscissa v. genuina (10a); 389, 403, 411 nevadensis v. rigida (30b); 415 oxygona (18); 419 nevadensis v. rigida (30b); 436 micrantha v. genuina (7a); 438 nevadensis v. genuina (30a); 555 nevadensis v. rigida (30b); 838 intermedia (28); 843 angustifolia (8); 844 micrantha v. genuina (7a); 846, 847 pterocarya v. cycloptera (19b); 848 nevadensis v. genuina (30a); 849 angustifolia (8); 850, 851, 852 intermedia (28); 853, 855 angustifolia (8); 856 pterocarya v. cycloptera (19b); 857 micrantha v. genuina (7a); 858 micrantha v. lepida (7b); 859 nevadensis v. genuina (30a); 862 barbigera (29); 863, 920, 921, 922, 923, 929, 938, 1112 intermedia (28); 1178 muricata v. Jonesii (32b); 1179 intermedia (28); 1301 micrantha v. lepida (7b); 1302, 1303 muricata v. Jonesii (32b); 1304 micrantha v. genuina (7a); 1305 microstachys (48); 1306 muricata v. Jonesii (32b); 1347 micrantha v. lepida (7b); 1348, 1349, 1350 intermedia (28); 1512 angustifolia (8); 1513 barbigera (29); 1514 costata (6); 1515 micrantha v. genuina (7a); 1516 barbigera (29); 1517 angustifolia (8); 1518 intermedia (28); 1519 barbigera (29); 1520 maritima v. genuina (16a); 1522 decipiens v. genuina (25a); 1523 maritima v. genuina (16a); 1524 costata (6); 1525 nevadensis v. genuina (30a); 1526 utahensis (17); 1526a angustifolia (8); 1527 costata (6); 1528 maritima v. pilosa (16c); 1781 muricata v. Jonesii (32b); 1782 utahensis (17); 1783 intermedia (28); 1785 angustifolia (8); 1918 micrantha v. genuina (7a); 1950 maritima v. genuina (16a); 2063 intermedia (28); 2065a ptero-

carya v. cycloptera (19b); 2065b intermedia (28); 2066a angustifolia (8); 2066b holoptera (1); 2067, 2068, 2069 maritima v. genuina (16a); 2070 holoptera (1); 2071a maritima v. pilosa (16c); 2071b angustifolia (8); 2072 decipiens v. genuina (25a); 2073, 2074, 2075, 2076 utahensis (17); 2075 intermedia (28); 2078, 2079 racemosa (2); 2079 pterocarya v. cycloptera (19b); 2082 utahensis (17); 2083 intermedia (28); 2084 pterocarya v. genuina (19a); 2087 intermedia (28); 2088 maritima v. genuina (16a); 2089 barbigera (29); 2091 angustifolia (8); 2092 barbigera (29); 2093 utahensis (17); 2117 simulans (39); 2118 angustifolia (8); 2275 intermedia (28).

Stevens, G. W. 245, 282, 598, 616, 664, 3040 minima (23).

Suksdorf, W. N. 46 simulans (39); 179 affinis (56); 180 Hendersoni (36); 181 simulans (39); 220 Clevelandi v. florosa (50b); 404 circumscissa v. genuina (10a); 405 scoparia (31); 406 ambigua (40); 455 affinis (56); 456 Hendersoni (36); 593 Torreyana v. genuina (38a); 594 ambigua (40); 595 simulans (39); 789 Torreyana v. genuina (38a); 889 pterocarya v. genuina (19a); 1494 scoparia (31); 1495, 2346 rostellata (53); 2768, 3207 affinis (56); 3278 Hendersoni (36); 7757 Clevelandi v. florosa (50b).

Summers, R. W. 598 hispidissima (47); 598, 899 Clevelandi v. florosa (50b).

Thornber, J. J. 407, 516 angustifolia (8).

Thurber, G. 61 crassisepala (24); 181 micrantha v. genuina (7); 690 angustifolia (8).

Tidestrom, I. 9026 pterocarya v. genuina (19a).

Torrey, J. 329 flaccida (54); 330 Torreyana v. genuina (38a); 331 affinis (56); 332 circumscissa v. genuina (10a); 333 flaccida (54); 335 ambigua (40); 336 circumscissa v. genuina (10a); 337 Torreyana v. genuina (38a).

Toumey, J. W. 240a crassisepala (24).

Tracy, J. P. 439 flaccida (54); 761 micromeres (15); 793 Torreyana v. pumila (38c); 1653, 1731 Torreyana v. genuina (38a); 1744 Hendersoni (36); 1809 hispidissima (47); 1865 Torreyana v. calistogae (38b); 1879 Torreyana v. genuina (38a); 1880 flaccida (54); 2054, 2060 Torreyana v. pumila (38c); 2074 micromeres (15); 2094 Torreyana v. calistogae (38b); 2457 leiocarpa (46); 2758 flaccida (54); 3071 Torreyana v. genuina (38a); 3335 Hendersoni (36); 3655, 3944, 4301, 4560 Torreyana v. genuina (38a).

Tracy, S. M., & Earle, F. S. 105 pusilla (5); 176 albida (11).

Trask, B. 57 Traskae (37); 56, 57 maritima v. genuina (16a).

Tucker, S. 127 Torreyana v. genuina (38a).

Vasey, G. R. 421 pterocarya v. genuina (19a); 434 Kelseyana (22); 434a Fendleri (45).

Vorhies, C. T. 124 Fendleri (45).

Walker, E. P. 155 minima (23).

Ward, L. F. 1231 gracilis (44).

Ware, R. A. 2690c glomeriflora (57).

Watson, S. 286a ambigua (40); 847. 848 circumscissa v. genuina (10a); 850 nevadensis v. genuina (30a); 856 micrantha v. genuina (7a); 858 Torreyana v. genuina and Watsoni (38a and 43); 859 pterocarya v. genuina (19a).

Wilson, N. C. 170 racemosa (2).

Wright, C. 488 albida and texana (11 and 21); 1565 micrantha v. genuina (7a); 1570 pterocarya v. cycloptera (19b); 1571 pusilla (5); 1572 albida (11).

Wright, W. G. 11 simulans (39); 98 intermedia (28); 1764. 1770 pterocarya v. cycloptera (19b).

Xantus, J. 76 Grayi v. cryptochaeta (9c); 84 microstachys (48); 85 decipiens v. corollata and nevadensis v. rigida (25b and 30b).

Yates, H. S. 402 Hendersoni (36).

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I. RECORDS PRELIMINARY TO A GENERAL TREATMENT OF THE EUPATORIEAE,—V.

By B. L. Robinson.

In the course of the past year the writer's attention to the *Eupatorium* tribe has been chiefly directed to the preparation of a keyed recension of the shrubby and arborescent species of the genera of *Eupatorium* and *Ophryosporus* for Mr. P. C. Standley's well known and very useful enumeration of the woody plants of Mexico. In the course of this work it has been necessary to reach at least provisional decisions regarding some of the early and obscure Mexican species, as well as to segregate certain inconsistent elements traditionally associated with broadly interpreted species like *Eupatorium calaminthaefolium* HBK.

The writer has also had the privilege of examining the entire material of the American *Eupatoricae* from the Botanical Museum of Copenhagen most kindly lent for study. This collection is exceptionally rich in the plants of southern Mexico, Costa Rica, portions of the West Indies, Venezuela, and Brazil, since it includes unusually complete sets of the valuable Liebmann, Oersted, Warming and Eggers series, as well as much West Indian and tropical American material of earlier date.

Another loan of *Eupatoricae determinandae* has been received from the Museum of Natural History in Paris, including highly interesting plants of Gaudichaud, d'Orbigny, Weddell, and Triana.

Further progress has been made on the identification of loans from the Royal Gardens at Kew, the University of Geneva, the New York Botanical Garden, the United States National Herbarium, the Missouri Botanical Garden, and the Field Museum of Natural History mentioned in previous papers of this series.

Prof. Hans Schinz, Director of the Botanical Garden and Museum at Zurich, has kindly supplied helpful specimens of the horticultural Eupatoriums cultivated at his establishment.

So far as diagnoses and notes have resulted from the study of these collections during the past year they are recorded below.

An extended and exceedingly interesting collection of Eupatoriums, obtained during Dr. Ekman's intensive exploration of Cuba, has been referred to the writer by Prof. I. Urban for identification, but arrived too late for the inclusion of its new species in the present paper. It is hoped that they may be put on record in the succeeding number of this series.

PIQUERIA CUMINGII Robinson, Proc. Am. Acad. xlii. 11 (1906). Further material of this little known species has been seen in a recent loan from the Paris Museum of Natural History. It consists of an unnumbered specimen collected at Cobija, Chile, by Gaudichaud in 1846 (Par., phot. Gr.). In habit and essential features it agrees closely with the type, but its leaves (sometimes 3-nerved) are as much as 8 mm. wide and the heads but 2–3-flowered.

Ophryosporus petraeus, comb. nov. *Eupatorium petraeum* Robinson, Proc. Am. Acad. xli. 275 (1905). From further study of the proper boundary between the genera *Eupatorium* and *Ophryosporus* it now seems clear that this and the following species are best referred to the latter genus. In both these species the summit of the connective is slightly expanded and thickened, but the anthers have no membranaceous appendage, a feature universal *Eupatorium*. Furthermore, the style-branches in these species are perceptibly knobbed at the tip, a trait characteristic of *Ophryosporus*. The occasional occurrence of one or two narrow and caducous pales on the outer portion of the very small disk has not been found a character of sufficient definiteness or constancy to be of use in the classification of this group. As to habit these species go quite as appropriately with *Ophryosporus* as with *Eupatorium*, for in the latter they approach only *E. polybotryum* DC. and *E. microcephalum* Gray, species which are not satisfactorily distinguishable from each other or from *Ophryosporus alternifolius* (DC.) Benth. & Hook. f. and which for similar reasons should be referred to *Ophryosporus* rather than *Eupatorium*.

O. scabrellus Robinson, comb. nov. *Eupatorium scabrellum* Robinson, Proc. Am. Acad. xxxv. 339 (1900).

ALOMIA MYRIADENIA (Sch.-Bip.) Bak. in Mart. Fl. Bras. vi. pt. 2, 192 (1876). To this well marked species belongs Glaziou's no. 15,154 (if one may judge from its representation in the Botanical Museum of Copenhagen), a number listed by Glaziou, Bull. Soc. Bot. Fr. lvi. Mém. 3, 391 (1909), as *Eupatorium betonicaeforme* Bak. Re-examination of several specimens of *Alomia myriadenia* shows that its achenes, which are black and shining, are consistently attached to the receptacle at their slightly incurved base by an unusually large yellowish-white somewhat hook-shaped, reniform or slightly sigmoid callosity 0.6–0.7 mm. in length. Baker, l. c., describes this species as suffruticose but a specimen collected on the Serra da Piedade by Reinhardt (Copenh.) shows it flowering and fruiting at a height of 3 dm. with a single erect essentially herbaceous stem and a root of the annual type. Other specimens show that the species attains a greater stature, but none thus far seen by the writer shows lignescence.

Eupatorium angustissimum, var. *goyazense* Glaziou, Bull. Soc. Bot. Fr. lvi. Mém. 3, p. 387 (1909), without diagnosis. In mentioning this undescribed variety in the list of his plants collected in central Brazil Glaziou indicates that it came from Vargem de Chico Costa in Goyaz, that it was based on his no. 21,615, and that it had been deposited in the herbaria of Paris, Berlin and Kew. Interpreted from the Kew isotype, kindly lent to the writer for examination, Glaziou's variety proves to have 8–10-ribbed achenes, which are rather densely short-villous. It is clear that these are not the achenes of *Eupatorium angustissimum* Spreng., nor indeed of the genus *Eupatorium* at all. On the other hand the specimen corresponds in all important characters and nearly all minor details with BRICKELLIA BRASILIENSIS (Spreng.) Robinson, var. PERNAMBUCENSIS Robinson, from which it appears to differ only in having somewhat shorter and uniformly entire leaves.

E. (§ **Subimbricata**) **Bakerianum**, nom. nov. *E. cinereum* Bak. Journ. Bot. xx. 226 (1882), not Linnaeus f., Raf., nor Griseb. The specific name used by Baker having homonyms of earlier date, at least one of which is still by some writers maintained as valid, must of course give place to some more distinctive designation. In selecting such a name it is a pleasure to commemorate in this species the notable work of Mr. J. G. Baker whose treatment of *Eupatorium* in the Flora Brasiliensis forms probably the most important single contribution to the knowledge of the genus since the publication of the fifth volume of De Candolle's Prodromus in 1836.

E. calophyllum (Greene), comb. nov. *Kyrstenia calophylla* Greene, Leafl. i. 11 (1903). This plant of Coahuila, San Luis Potosi and Hidalgo has long passed as a mere form of *E. calaminthaefolium* HBK., but in the light of the material of both now available it appears probable that they are separable species rarely if at all intergrading. In *E. calaminthaefolium* the leaves are membranaceous or nearly so, and obscurely reticulated; in *E. calophyllum* they are coriaceous or firmly fleshy and curiously scrobiculate. In both species there is glandular punctation on the leaves but these glands tend to be differently arranged. In *E. calaminthaefolium* they are mostly found in the ultimate areolae of the netted veinlets, while in *E. calophyllum* the glands are nearly all along the (often elevated and slightly scored) veinlets. While in inflorescence and floral details, these species are much alike, such distinctness of foliage combined with difference of range, makes it pretty certain that they are best treated as distinct species.

E. (§ EXIMBRICATA) ESPINOSARUM, var. **doratophyllum**, nom. nov., formam typicam multis simulans differt foliis lanceolatis vel ovato-lanceolatis 2.5–3 cm. longis 9–13 mm. latis nec rite ovatis ut apud formam vulgarem.—*E. Robinsonianum* Greene, Erythea, i. 150 (1893).—MEXICO: cañon walls and ledges near Lake Chapala, Jalisco, 18 Nov. 1892, *Pringle*, no. 4353 (TYPE, Gr.); Tequixquiac, 30 Aug. 1903, *Rose & Painter*, no. 6625 (Gr.). This variety possesses the glutinous quality of the typical form, though perhaps in somewhat slighter degree.

E. (§ **Eximbricata**) **etlense** Robinson, spec. nov., fruticosum graciliter ramosum; ramis subteretibus brunnescente griseis; ramulis costulatis crispe puberulis vel granulatis; foliis oppositis ovatis obtusis vel breviter acuminatis crenatis vel crenato-serratis basi rotundatis vel subcordatis saepe obliquis 2.5–6 cm. longis 1.7–4.2 cm. latis membranaceis subconcoloribus vel distincte subtus pallidioribus supra parcissime pubentibus subtus villosis a basi 3–5-nervatis; venulis minute reticulatis pulcherrime translucentibus; venulis in areolis inclusis libris; petiolo gracili 7–32 mm. longo; corymbis (immaturis) subdensis valde convexis ca. 4 cm. diametro griseo-pubescentibus; capitulis pedicellatis 22–23-floris 8 mm. longis; involucri squamis ca. 20 lanceolato-linearibus acutis subaequalibus (1–3 extimis exceptis) ca. 4 mm. longis dorso griseo-pubescentibus; corollis albis glabris 4.5 mm. longis gradatim a tubo gracili in fauces paullo ampliatis; dentibus limbi patentibus deltoideis ca. 0.6 mm. longis; achaeniis 2 mm. longis obscure puberulis vel glabris; pappi setis ca. 20 albis capillaribus corolla distincte brevioribus.—MEXICO: Las Sedas, District of Etla, Oaxaca, alt. 1900 m., 20 Oct. 1907, *Prof. C. Conzatti*, no. 2071–2072 (TYPE, U. S. Nat. Herb., phot. and fragm. Gr.). A slender shrub of rather characteristic habit and with leaves exhibiting in transmitted light a close and striking pellucid reticulation in which there are free veintips in the areolae.

E. (§ **Eximbricata**) **eucosmoides**, spec. nov., fruticosum vel herbaceum et perenne (basi ignota) inflorescentia excepta glaberrimum; caule (vel ramo) tereti rubro-brunneo arcuato ca. 3 mm. diametro albo-medulloso; internodiis 3–4 cm. longis; foliis oppositis petiolatis anguste ovatis acuminatis obscure cuspidato-denticulatis basi acutis vel subacutis supra basin pinnatim ca. 7-nervatis firmiter membranaceis utrinque glaberrimis minute reticulatis (venis utrinque subimpressis) infra paullo pallidioribus 6–7 cm. longis 3–4 cm. latis; petiolo 9–15 mm. longo; panicula terminali breviter pyramidata ca. 1 dm. alta et 13 cm. crassa; paniculae ramulis obscure lanulosis; bracteolis

subulatis; inflorescentiae partialibus corymbiformibus rotundatis densiusculis; capitulis ca. 30-floris ca. 8 mm. longis et 9 mm. diametro; involucri squamis linearibus subacutis vix imbricatis subglabris firmiusculis; corollis 3.5–4 mm. longis subcylindratis sine faucibus distinctis; dentibus limbi ca. 0.4 mm. longis; achaeniis ca. 2 mm. longis paullo hispidulis; pappi setis ca. 20 capillaribus vix scabratis ca. 3 mm. longis.—PERU: *Matheus*, no. 1123 (Par., phot. and small fragm. Gr.). This sheet now in the Museum of Natural History at Paris is one of a collection of plants secured in the interior of Peru by Alexander Mathews and by him given or sold to Gaudichaud while, as botanist of the Bonite, he visited Peru in 1836–37. The species bears some habital similarity to the Bolivian *E. eucosmum* Robinson, but that has sharply toothed leaves, shorter, broader, phyllaries and fewer-flowered heads.

E. (§ **Eximbricata**) **hebes**, spec. nov., fruticosum ut videtur erectum (basi ignota) oppositirameum saltim post exsiccationem sordide vel fulvescente brunnescens; foliis oppositis deltoideo-ovatis vel rite ovatis subintegris apice et angulis lateralibus obtusissimis rotundatis supra rugulosis obscure puberulis subtus pallidioribus fulvo-brunneis minute reticulatis paullo supra basin 3-nervatis in venulis hirtellis et cum glandulis ornatis 2–3.2 cm. longis 1.5–3 cm. latis subchartaceis; petiolo foliorum caulinum maturorum ca. 12 mm. longo glandulari-hispido; corymbis terminalibus planiusculis ca. 8 cm. diametro; capitulis maturitate 8–9 mm. longis ca. 13-floris pedicellatis; involucri squamis lanceolatis acutis ca. 4.5 mm. longis vix imbricatis dorso puberulo-granulatis brunnescentibus; corollis ca. 5 mm. longis glabris; tubo proprio gracili ca. 1 mm. longo; faucibus gradatim ampliatis 3 mm. longis; dentibus limbi anguste ovatis ca. 0.7 mm. longis; achaeniis nigris deorsum attenuatis ca. 2.5 mm. longis sursum griseo-hispidulis; pappi setis ca. 30 corollam subaequantibus sordide albis capillaribus barbellato-scabratis.—MEXICO: "Meoatlan, S. Andres," October, 1842, *Liebmann*, no. 75 in chief part (TYPE, Bot. Mus. Copenhagen, phot. and fragm. Gr.).

By Schultz-Bipontinus this was regarded as a variety of *E. calaminthaefolium* HBK., but it differs from that species in many respects, as for instance in its much larger flatter inflorescences, and subentire leaves of firmer texture without glandular punctation.

Two varieties of this plant were associated by Liebmann under his no. 75. These may be distinguished as follows:

Var. **typicum**, caule ramisque subteretibus; caule et ramis et inflorescentia minute granuloso-puberulis et cum pilis articulatis glan-

dulari-capitulatis patentibus dense vestitis.—Liebmann's no. 75 in greater part.

Var. **rasum**, var. nov., caule (juventate) sulcato-angulato; caule et inflorescentia minutissime pulverulo-puberulis sine pilis glandularibus patentibus.—Liebmann's no. 75 in small part.

These varieties correspond in other respects very precisely and their differences are of a nature frequently exhibited by plants of the same species. Although intergradation between them has yet to be demonstrated it can be confidently anticipated.

E. (§ **Eximbricata**) **hidalgense,** spec. nov., fruticosum 9–15 dm. altum primo aspectu glabrum sed in novellis minute crispeque purpureo-puberulum copiose ramosum saepe furcatum (axibus repetite abortivis et ab ramis superatis); caulibus ramisque fusco-griseis teretibus; foliis oppositis rhombeo-oblongis apice angustatis sed obtusis vel rotundatis basi acutis subintegris vel integerrimis minutissime puberulis supra viridibus subtus pallidioribus et minute punctatis supra basin 3-nervatis, 1.5–3 cm. longis 1–1.5 cm. latis; petiolo 2–5 mm. longo; corymbis numerosis planiusculis 3–6 cm. latis; capitulis pedicellatis 8–13-floris 8–10 mm. altis ca. 7 mm. diametro; involucri squamis linearibus ad apicem obtusum angustatis 4–5 mm. longis saepe purpurascentibus ciliolatis glandulari-granulatis; corollis albis glabris; tubo proprio 1.5 mm. longo; faucibus cylindratis 3–4 mm. longis; dentibus limbi ovato-oblongis acutis 0.8 mm. longis; achaeniis nigris ca. 3 mm. longis gracilibus cum glandulis globosis sessilibus numerosis ornatis; pappi setis ca. 40 inaequalibus saepissime roseis.—MEXICO: Sierra de Pachuca, alt. 2900 m., 22 Aug. 1902, *Pringle,* no. 9903 (TYPE, Gr., distributed as *E. calaminthaefolium*), and 8 Sep. 1899, *Pringle,* no. 7958 (Gr.); on rocky soil in mountain woods, El Chico near Pachuca, Sep. 1905, *Purpus,* no. 1490 (Gr., distributed as *E. erythropappum* and mixed with *E. lucidum*); Zimapan, *Coulter,* no. 269 (Gr., mixed with a *Stevia*); between Pachuca and Real del Monte, *Rose & Painter,* no. 6671 (Gr., U. S.).

This species has leaves either entire or undulately 3–5-toothed toward the apex. In shape they differ much from those of *E. calaminthaefolium* HBK. and in nervation and much smaller size are readily distinguishable from those of *E. erythropappum* Robinson, a plant which is probably only a form of the variable *E. ligustrinum* DC.

E. (§ **Eximbricata**) **irrasum**, comb. nov., fruticosum valde ramosum; ramis teretibus atrogriseis glabratis; ramulis crispe puberulis vel tomentellis; foliis parvis oppositis petiolatis ovatis vel suborbicularibus obtusissimis integris vel paucicrenatis basi rotundatis supra

viridibus breviter pubescentibus subtus griseo-tomentosis 7–15 mm. longis 5–16 mm. latis; corymbis numerosis in ramulis terminalibus plerisque 3–9-capitulatis valde convexis; capitulis ca. 10–12-floris ca. 11 mm. altis; involucri squamis ca. 11 lanceolato-linearibus acutis 5.5 mm. longis dorso griseo-pubescentibus purpurascentibus; corollis purpureis glabris ad 5.5 mm. longis; tubo proprio ca. 2 mm. longo; faucibus distincte ampliatis subcylindratis 3.5 mm. longis; dentibus limbi anguste ovatis acutis 0.7 mm. longis; achaeniis gracilibus 3.4–3.8 mm. longis argute pentagonis hispidis; pappi setis ca. 35 capillaribus scabratis corollam subaequantibus vel etiam paullo superantibus.—*E. calaminthaefolium*, var. *irrasum* Robinson, Contr. Gray Herb. lxviii. 11 (1923).—MEXICO: on the Cordillera in Oaxaca, alt. 2135 m., *Galeotti*, no. 2022 (TYPE, Par., phot. Gr.); barren hills about Esperanza, Puebla, alt. 2660 m., *Pittier*, no. 435 (U.S.); from same locality, *Purpus*, no. 2457 (Gr., U.S.).

Further study of this and the nearly related Eupatoriums of Mexico makes it clear that they are better treated as a group of independent species of close affinities rather than as varieties or forms of *E. calaminthaefolium* as they have long been referred in herbaria. They are differentiated and keyed in another paper now in press.

E. LIGUSTRINUM DC. Prod. v. 181 (1836). *E. micranthum* Lag. as doubtfully interpreted by Lessing, Linnaea, v. 138 (1830), but surely not *E. micranthum* Lag. Gen. et Spec. 25 (1816), which is stated to have had many-flowered heads, subimbricate involucre, and sky-blue corollas, and was presumably an *Ageratum* of the *A. corymbosum* group. *E. semialatum* Benth. Pl. Hartw. 76 (1840). *E. myriadenium* Schauer, Linnaea, xix. 721 (1847). *E. Weinmannianum* Regel & Koern. Ind. Sem. Hort. Petrop. 1857, p. 41 (1857). *E. bicaps* Klotzsch ex Vatke, Bot. Zeit. xxx. 719 (1872), where many horticultural synonyms of this species are indicated. *E. popocatapetlense* "Schl." ex Hemsl. Biol. Cent.-Am. Bot. ii. 99 (1881), a binomial somewhat doubtfully ascribed to Schlechtendal by Hemsley but probably originating in a very similar though not precisely identical name used in herbaria but never published by Schultz-Bipontinus.—This species, extensively grown as a greenhouse plant, runs in cultivation into several horticultural forms differing in compactness of habit as well as in the texture, size, and contour of the leaves. Botanical varieties do not appear to have been described, but the following, occurring in nature and being readily distinguishable, may well be put on record.

Var. **typicum**, in inflorescentia breviter puberulum non villiferum: foliis subtus obscure puberulis penniveniis.

Var. **villiferum**, var. nov., in ramulis et petiolis et inflorescentia tum villiferum tum puberulum; foliis utrinque pubescentibus pinnatim 3–5-nervatis potius quam penniveniis.—MEXICO: on mountains near Carneros Pass, Coahuila, alt. 2600 m., 15 Sept., 1889, *Pringle*, no. 2465 (TYPE, in Gray Herb.), distributed as *E. popocatapetlense;* region of San Luis Potosi, 1878, *Parry & Palmer*, nos. 335 (Gr.), distributed as *E. glaucum* Sch.-Bip., and 346 (Gr.).

E. (§ **Praxelis**) **odontodactylum**, spec. nov. *E. capillare*, var. *Riedelii* (Sch.-Bip.) Bak. in Mart. Fl. Bras. vi. pt. 2, 341 (1876). *Praxelis Riedelii* Sch.-Bip. ex Bak. l. c., not *Eupatorium Riedelii* (Sch.-Bip.) Bak. In his studies of the Brazilian Eupatoriums the writer has seen many specimens of the delicate annual *E. capillare* (DC.) Bak. It has been found quite uniform in possessing entire and very narrow leaf-segments not 0.5 mm. in width and very obscurely if at all punctate; the heads are subcylindric and nearly always nodding on their capillary pedicels. From that plant the one called var. *Riedelii* by Baker seems to differ so clearly and constantly as to merit recognition as a separate species. It is a somewhat stouter plant with shorter internodes. Its leaf-segments, especially the middle ones, are distinctly toothed. They are lance-linear instead of filiform and become sometimes as much as 2 mm. wide. The heads are more campanulate in form and are in general erect. Furthermore the leaves are distinctly punctate. The name *Riedelii* employed by Schultz for this plant under *Praxelis* being already occupied in *Eupatorium*, it becomes needful to give the species a new name. Riedel's no. 1405 collected "in saxosis humidis prope Ypanema," Jan. 1826 (Gr.) may be taken as the type.

E. (§ **Subimbricata**) **Ortegae**, spec. nov., fruticosum oculo nudo laeve; caulibus ramisve teretibus gracilibus purpurascenti-griseis; internodiis 2.5–7 cm. longis; foliis oppositis graciliter petiolatis deltoideo-ovatis acuminatis basi abrupte angustatis vel subtruncatis lateraliter argute paucidentatis chartaceo-coriaceis utrinque laete viridibus et cum venulis prominentibus reticulatis ima a basi 3-nervatis supra glaberrimis subtus obscure in nervis granulato-puberulis 3.5–8.5 cm. longis 2.5–5 cm. latis; petiolo 1.5–3 cm. longo supra canaliculato; panicula terminali oppositiramea ovoidea 5–14 cm. alta et crassa; capitulis ca. 28-floris ca. 7 mm. longis et 6 mm. diametro ad apices paniculae ramorum in corymbos valde convexos aggregatis; pedicellis cum bracteolis lineari-subulatis attenuatis ornatis; involucri squamis ca. 18 lanceolato-linearibus attenuatis subglabris dorso 1-sulcatis; corollis albis glabris; tubo sine faucibus

distinctis ca. 3 mm. longo; dentibus limbi anguste deltoideis ca. 0.7 mm. longis; achaeniis atrobrunneis glabris 2.8 mm. longis; pappi setis ca. 20–25 albis corollam subaequantibus.—MEXICO: La Bajada, Tamazula, Durango, alt. 300–600 m., Nov. 1921, *J. G. Ortega*, no. 4449 (TYPE, Gr. U.S.).

This neat and attractive shrub is most nearly related to *E. Haenkeanum* DC. but differs in its firmer brighter green strongly reticulated leaves and much narrower and attenuate phyllaries.

E. PACHYPODUM Robinson, Proc. Am. Acad. xxxvi. 481 (1901). This little known and presumably very local species was described from material collected by Pringle, 26 May, 1891, on rocky hills near Guadalajara. In this the leaves were subsessile and very small, not above 1.3–1.8 cm. in length, being much exceeded by the internodes. It has recently been possible for the author to re-examine the species in a specimen lent him from the Botanical Museum at Copenhagen. This was collected by Mr. Pringle also near Guadalajara but later in the season, being gathered 27 Oct., 1903. It shows leaves as much as 3 cm. in diameter, mostly equalling or somewhat exceeding the internodes, finely and prominently reticulated and of firm texture, their petioles being 3–3.5 mm. long.

E. (§ **Eximbricata**) **porriginosum,** spec. nov., copiose et fastigiatim ramosum fruticosum 9–15 dm. altum; caule tereti tardius glabrato a cortice grisea tecto; ramis ramulisque crispe puberulis erectis vel adscendentibus foliosis; foliis oppositis petiolatis parvis ovalibus vel integerrimis vel utroque latere 1–3-serrato-dentatis apice basique obtusis vel rotundatis membranaceis subtus paullo pallidioribus utrinque sparce puberulis et punctatis saepissime in pagina superiori obscure albido-maculatis quasi lepidotis 1–2 cm. longis 7–15 mm. latis; corymbis numerosis paucicapitulatis umbelliformibus; pedicellis 1–1.8 cm. longis saepe capitula longitudine superantibus; capitulis ca. 15-floris 10–12 mm. longis; involucri squamis anguste lanceolatis quam flosculi dimidio brevioribus acutis dorso crispe puberulis pallide viridibus saepe purpureo-tinctis; corollis vel albis vel roseo-purpureis glabris; tubo proprio gracili fauces cylindratas ampliatas subaequante; achaeniis brunneis dense breviterque hispidulis; pappi setis saepe roseis corollam subaequantibus.—MEXICO: bluffs of barranca above Santa Fe, Federal District, alt. 2440 m., *Pringle*, no. 6552; San Angel near Mexico, *Bourgeau*, no. 170 (Gr., Univ. Geneva); dry mesas near Metepec Station, Hidalgo, 22 June, 1904, *Pringle*, no. 13,047 (TYPE, in Gray Herb.); Cerro Verde, Oaxaca, *Purpus*, no. 3136 (Gr.). All these specimens have been distributed as *E. cala-*

minthaefolium HBK. They are manifestly close to that species in their affinities but differ in several traits. In *E. calaminthaefolium*, as shown by the original plate and by a photograph of the type, the leaves are of a broader more suborbicular form, in fact often broader than long. They tend to be somewhat larger and more deeply and crenately toothed, and of slightly more chartaceous texture. They lack the characteristic though somewhat faint maculation on the upper surface. There are perceptible differences also in the inflorescence and it seems probable that the plants, though in many respects similar, are distinct species. This group of low shrubs is keyed and described in another paper now in press.

E. (§ **Eximbricata**) **rhodopodum**, spec. nov., fruiticosum verisimiliter erectum primo aspectu glabrum sed superne parce patenterque pilosum, pilis articulatis; caule tereti pallide brunneo; ramis oppositis adscendentibus atropurpureis; foliis oppositis brevissime petiolatis late ovatis vel ovato-oblongis acutis vel obtusiusculis aut integris aut undulatis aut in latere uno vel utroque 1–5-dentatis glaberrimis vel cum ciliis raris ornatis concoloribus paullo supra basin 3-nervatis impunctatis 2–3 cm. longis 1.3–2 cm. latis coriaceis; petiolo 1–2 mm. longo crasso purpureo-rubro; corymbis terminalibus planiusculis vel convexis 3–6 cm. latis fastigiatis; pedicellis 1–1.5 cm. longis rectiusculis hirtellis; capitulis ca. 25-floris, ca. 9 mm. longis et crassis; involucri squamis ca. 18 lanceolatis acutis glabris viridibus; disco planiusculo nudo; corollis albis vel paullo roseis glabris; tubo proprio ca. 1 mm. longo; faucibus subcylindratis distincte ampliatis 3.5 mm. longis; dentibus limbi ovatis subacutis 0.7 mm. longis; achaeniis nigris deorsum descrescentibus 2–2.5 mm. longis; pappi setis ca. 30 pulcherrime roseis ca. 3.5 mm. longis.—Mexico: Minas de San Rafael, San Luis Potosi, Nov. 1910, *Dr. C. A. Purpus*, nos. 4792 (type, in Gray Herb.), distributed as *E. popocatapetlense;* and 4796 (U.S.), distributed as *E. calaminthaefolium*.

From both the species to which this plant has been referred it can be readily distinguished by its scarcely petioled leaves. It is much more nearly related to *E. glaucum* Sch.-Bip. but that has much smaller mostly 1-nerved leaves of more elliptic form and about 14-flowered heads.

E. stachyophyllum Spreng. Syst. iii. 420 (1826). In a loan of undetermined *Eupatoriae* recently received from the Paris Museum of Natural History for study and identification is a specimen of this species bearing the following data: Bolivia: Prov. Santa Cruz, Nov. 1845, *H. Alg. Weddell*, no. 3561. This is, it is believed, the first re-

corded occurrence of *E. stachyophyllum* in Bolivia. The species, while constant in essentials, is notably variable in leaf-breadth. The Bolivian plant here cited has broad elliptic-ovate leaves, of which the larger are 4.8–5.3 cm. long and 3–4 cm. wide.

E. (§ **Eximbricata**) **subintegrum** (Greene), comb. nov. *E. Espinosarum*, var. *subintegrifolium* Robinson, Proc. Am. Acad. xxvi. 165 (1891). *Kyrstenia subintegra* Greene, Leafl. i. 10 (1903). While closely related to *E. Espinosarum* Gray, this vernicose Mexican shrub, now known from several consistent collections, is found to differ in having longer heads fully 1 cm. high, more attenuate and relatively narrower phyllaries, as well as subentire and more gradually acuminate leaves. It is believed that Greene's treatment of it as an independent species is justifiable. However, *Kyrstenia* to which he referred this plant is merely a rather weak section of *Eupatorium*. The needed combination under *Eupatorium* is therefore here recorded. It will be noted that Greene is transferring *E. Espinosarum*, var *subintegrifolium* to *Kyrstenia* changed the name to *subintegra*. This, being accordingly the first designation for the plant in the specific category, must be maintained by those who treat it as an independent species even though there is an earlier varietal name.

E. (§ **Eximbricata**) **thysanolepis**, spec. nov., suffrutescens brunneo-tomentosum 3–5 dm. altum in parte superiori copiose ramosum; ramis patenter adscendentibus foliosis; caule tereti dense breviterque brunneo-tomentoso ad 5 mm. diametro; foliis oppositis vel ternatis (supremis aliquando subalternis) petiolatis ovatis subacutis vel saepius obtusis undulatis vel leviter serratis (dentibus paucis 0.2–0.8 mm. altis inter se 4–6 mm. distantibus) basi integris obtusis vel rotundatis firmiter membranaceis supra puberulis vel pulverulentis nigrescentibus subtus brunneo-tomentosis fere a basi 3-nervatis 1.5–5.5 cm. longis 1–4 cm. latis; petiolo dense tomentoso 3–10 mm. longo; corymbo terminali basi folioso composito; capitulis 50–60-floris ca. 15 mm. altis et crassis; involucri squamis ca. 25 subaequilongis oblongis vel lanceolato-linearibus dorso brunneo-pubescentibus apicem versus in margine laceratis et vel acutiusculis vel in appendicem paullo dilatatis et obtusis 5–8 mm. longis; corollis albidis (Glaziou) glabris ca. 6 mm. longis gradatim a basi ad limbum ampliatis sine faucibus distinctis; achaeniis gracilibus saepius curvatis minutissime granulatis ca. 3 mm. longis; pappi setis ca. 25 sordide albidis ca. 4 mm. longis.—BRAZIL: Itacolumy near Ouro Preto, Minas Geraes, Dec. to Jan., *Glaziou*, no. 8135 (TYPE, in Bot. Mus. Copenhagen, phot. and small fragm. Gr.); also nos. 15,152 and 20,369 both in Bot. Mus. Copenhagen; also Serra da Stabira do Campo, *Lund* (Copenh.).

This is the plant which Baker took for *E. hebecladum* DC. and his description in the Flora Brasiliensis clearly relates to it and not at all to the De Candollean type. The latter, photographed at Geneva by the writer in 1905, is quite a different plant with relatively narrower leaves, which, as originally described by De Candolle, are acuminate at apex, truncate at base, and coarsely many-toothed. The inflorescence is spherical and raised distinctly above the leaves. Though these plants possess some points of similarity their differences are of a pronounced nature and they are certainly distinct species.

E. (§ **Eximbricata**) **ymalense**, spec. nov., fruticosum vel arborescens; caule tereti ad 1.5 cm. vel ultra crasso; cortice pallide griseo aetate suberoso firmo longitudinaliter rugoso; ramis ascendenter patentibus juventate flavido-brunneis costulatis pubescentibus; foliis oppositis petiolatis ovato-oblongis acuminatis primo aspectu integerrimis sed remote obscurissime cuspidato-denticulatis utrinque parce pubescentibus vix subtus pallidioribus 7–11 cm. longis 3–6 cm. latis membranaceis 3-nervatis; petiolo gracili 7–9 mm. longo; corymbis plurimis valde convexis in paniculam laxiusculam elongatam vel ampliatam foliaceo-bracteatam dispositis; capitulis ca. 13-floris, 6–7 mm. altis graciliter pedicellatis saepe nutantibus; involucri squamis ca. 14 subaequalibus linearibus caudato-attenuatis; corollis subtubulatis 4–4.5 mm. longis albescentibus glabris limbum versus granulatis; antheris apice distincte appendiculatis; achaeniis atrogriseis sublaevibus cum costis pallidioribus; pappi setis ca. 40 capillaribus flavescente albidis vix scabratis corollas subaequantibus.—*E. albicaule*, var. *laxius* Robinson, Proc. Am. Acad. xxxv. 330 (1900).—Mexico: Ymala, Sinaloa, 16–25 Aug., 1891, *Dr. Edward Palmer* no. 1474 (type, Gray Herb.; isotype, Mus. Bot. Copenhagen). The membranaceous rather than coriaceous leaves of this plant as well as the attenuate involucral scales show differences from *E. albicaule* Sch.-Bip. which seem amply to warrant its separation as a distinct species.

Kanimia goyazensis, spec. nov., herbacea virgata ubique breviter crispeque pubescens; radice fibrosa; caule virgato erecto vel brevissime imam ad basin subdecumbenti dense folioso ca. 3 dm. alto, internodiis plerisque vix 1 cm. longis; foliis numerosis ascendentibus imbricatis oppositis vel subopppositis subsessilibus lanceolato-oblongis integris vel apicem acutum vel obtusum vel etiam rotundatum versus obscure paucidentatis basi cuneatis penniveniis sed paullo supra basin obscure 3–5(–7)-nervatis utrinque breviter pubescentibus subtus prominenter reticulato-venosis 1.5–4 cm. longis 5–14 mm. latis; petiolo vix 2 mm. longo; inflorescentia juventate ovoidea maturitate

subcorymbosa et planiuscula ca. 8 cm. diametro basi foliaceo-bracteata; capitulis glomeratis sessilibus 4-floris 1 cm. vel ultra longitudine; bracteola lanceolato-lineari attenuata ca. 6 mm. longa ad capitulum arcte approximata; involucri squamis obovato-oblongis acutis ca. 8–9 mm. longis 2–2.6 mm. latis dorso tomentellis ca. 5-nervatis; corolla (immatura) ca. 6 mm. longa; tubo proprio gracili ca. 2 mm. longo; faucibus modice ampliatis ca. 1.8 mm. longis; dentibus limbi oblongis ca. 2.2 mm. longis; achaeniis (immaturis) breviter griseo-villosis 8–10-costatis 3.5 mm. longis 1.5 mm. diametro; pappi setis ca. 115 flavido-albidis ca. 7 mm. longis obscure scabratis.—*Eupatorium stachyophyllum* Glaziou, Bull. Soc. Bot. Fr. lvi. Mém. 3, p. 388, in part, not Spreng.—Brazil: between As Bracas and Os Ciganos, Goyaz, *Glaziou*, no. 21,635 (type, K., phot. and fragm. Gr.). A well marked species with very leafy stems unbranched up to the inflorescence, sessile leaves strongly reticulated beneath, and rather large (though still immature) heads. *Eupatorium stachyophyllum* Spreng., under which name this plant was listed, is of course very different, with smaller heads, pluriseriate involucre and 5-angled achenes.

II. THE OENOTHERAS OF NORTHWESTERN SOUTH AMERICA.

By P. A. Munz and I. M. Johnston.

The present paper is concerned with the Oenotheras of Bolivia, Peru, Ecuador, Colombia and Venezuela. The principal portion of the work upon it was done at the Gray Herbarium. Through the courtesy of Dr. N. L. Britton, Dr. W. R. Maxon and Mr. J. F. Macbride, we were allowed to examine, in addition to the available specimens in the Gray Herbarium (G), loans of material from the New York Botanical Garden (NY), United States National Herbarium (US), and the Field Museum of Natural History (FM). Subsequently the senior author visited, and studied the Oenotheras in, the herbaria at Yale University (Y), Philadelphia Academy (Ph), and Missouri Botanical Garden (Mo). Consequently the greater portion of the pertinent material available in the United States has been reviewed in the preparation of this synopsis. No pretense, however, is made to finality in the present treatment. Not until much more material is available from the area, and until the baffling complexities of the Argentine and Chilian species are understood can a satisfactory account of the northern Andean species be written.

Key to Species and Varieties.

Capsule broadest above the middle and frequently more or less winged, clavate. § *Hartmannia.*
- Petals 2–3 cm. long; body of capsule 1–1.5 cm. long, very broadly winged, long-villous ..... 1. *Oe. tetraptera.*
- Petals 0.5–1 cm. long; body of capsule 5–9 mm. long, with poorly developed rather thick wings if any, pubescence usually short.
  - Petals deep pink or purple; plant erect or ascending, more or less branched above; fruit not curved ..... 2. *Oe. rosea.*
  - Petals yellow or greenish; stems prostrate or decumbent, subsimple; fruit usually strongly curved.
    - Seeds large, ca. 1–1.5 mm. long; plant usually glabrate; leaves usually subcoriaceous, subentire; s. Ecuador to Bolivia ..... 3. *Oe. multicaulis.*
    - Seeds small, ca. 0.5–0.9 mm. long; plant usually pubescent on upper parts of stem; leaves usually thick-herbaceous, somewhat denticulate; c. Ecuador to Venezuela and Mexico ..... 3a. *Oe. m.* var. *tarquensis.*

Capsule cylindrical or if not then broadest above middle.
- Seeds ovoid, not at all angular; capsule subterete or obscurely angled. § *Raimmania.*
  - Plant densely caespitose, low and rounded; leaves numerous in close tufts, linear-lanceolate, repand-dentate; capsules crowded near base of plant, obscured by leaves, ca. 15 mm. long ..... 4. *Oe. punae.*
  - Plant evidently caulescent with leaves and flowers scattered along stem.
    - Plant perennial, decidedly woody at base; petals 2–2.5 cm. long; pubescence closely and densely strigose; sepal-tips corniculate, ca. 2 mm. long; style densely pubescent near base ..... 5. *Oe. Featherstonei.*
    - Plant annual or at most biennial, herbaceous throughout; sepal-tips undeveloped or frequently ca. 1 mm. long (in no. 7 ca. 2 mm. long); pubescence villous or none.
      - Petals 1–1.5 cm. long; hypanthium 20–30 mm. long; plant commonly freely branched from base; stems usually decumbent below, finely pubescent or villous, floriferous only above middle; seeds usually pitted, brown or ashy ..... 6. *Oe. laciniata.*
      - Petals 4–7 mm. long; hypanthium 5–15 mm. long.
        - Plant freely branched from base; branches decumbent, floriferous only above middle; plant dark green, finely pubescent; seeds yellowish, rather smooth; style glabrous ..... 6a. *Oe. l.* var. *limensis.*
        - Plant simple, erect, usually floriferous to base.
          - Hypanthium ca. 15 mm. long; sepal-tips 1–2.5 mm. long; plant green tinged with red, conspicuously villous; seeds brown, evidently pitted; style glabrous ..... 7. *Oe. arequipensis.*
          - Hypanthium 5–8 mm. long; sepal-tips ca. 1 mm. long; plant yellow-green, practically glabrous; seeds yellowish, rather smooth; style sparsely villulose near base ..... 8. *Oe. verrucosa.*

Seeds more or less prismatic, evidently angular; capsule strongly angled. § *Euoenothera.*
Petals 4–5 cm. long; capsule fusiform, 3–4 cm. long, base evidently narrowed, not noticeably ensheathed by leaf-base ..... 9. *Oe. fusiformis.*
Petals 0.5–2.5 cm. long; capsule oblong or ovate-oblong, 1.5–3 cm. long, base broad and more or less ensheathed by leaf-base.
Petals 0.5–0.9 mm. long; plant usually pallid with a fine strigose pubescence; capsule four times as long as thick..... 10. *Oe. rubida.*
Petals 1.2–2.5 cm. long; plant usually green, glabrate or somewhat villous.
Hypanthium 5–9 cm. long; capsule four to six times as long as thick; fresh flowers yellow..... 11. *Oe. elongata.*
Hypanthium 1–3(6) cm. long; capsule two to three times as long as thick; fresh flowers reddish or yellow..... 12. *Oe. campylocalyx.*

1. Oenothera tetraptera Cav. Icones iii. 40, t. 279 (1795). *Xylopleurum tetrapterum* Raim. in E. & P. Pflanzenf. iii. Abt. 7, 214 (1893). *Hartmannia tetraptera* Small, Bull. Torr. Bot. Cl. xxiii. 181 (1896). *Oe. tetraptera* f. *chenopodifolia* Lévl. Monog. 122 (1902). *H. macrantha* Spach, Nouv. Ann. Mus. Paris iv. 363 (1835); Hist. Veg. iv. 372 (1835).—Venezuela: La Puerta, Trujillo, 2000 m. alt., *Jahn 1137* (US); near Colonia Tovar, *Fendler 451* (G, isotype of f. *chenopodifolia* Lévl.).—Most common in Mexico; occurring within our limits only in northern Venezuela.

2. Oe. rosea Aiton, Hort Kew. ed. 1, ii. 3 (1789). *Hartmannia rosea* G. Don in Sweet, Hort. Brit. ed. 3, 236 (1839). *Xylopleurum roseum* Raim. in E. & P. Pflanzenf. iii. Abt. 7, 214 (1893). *Oe. rubra* Cav. Icones iv. 68, t. 400 (1797). *Oe. virgata* R. & P. Fl. Peruv. iii. 79, t. 315 (1802). *H. virgata* Spach, Nouv. Ann. Mus. Paris iv. 361 (1835). *H. gauroides* Spach, Nouv. Ann. Mus. Paris iv. 363 (1835); Hist. Veg. iv. 371 (1835). *H. affinis* Spach, Ann. Sci. Nat. ser. 2, iv. 167 (1835). (?) *Oe. epilobiifolia* HBK. Nov. Gen. et Sp. vi. 92 (1823). (?) *H. epilobiifolia* Spach, Nouv. Ann. Mus. Paris iv. 364 (1835).—Ecuador to Chile; reported by Léveillé, Monog. 113, from Venezuela. Occurs from southeastern United States to Costa Rica, also in Cuba, and in eastern Brazil.—Bolivia: Cotaña, 2450 m. alt., *Buchtien 148* (G, FM), *5984* (US); La Granga, 2600 m. alt., *Bro. Julio 115* (US); Sorata, *Williams 1548* (US), *Mandon 630* (G), *Rusby 1814* (G, FM, US); Capi, *Bang 779* (G, Mo, US); near Mapiri, *Bang 1746* (G, FM, Mo, US); without locality, *Bang 2007* (NY). Peru: Torontoy, Urubamba Valley, 2400 m. alt., *Cook & Gilbert 820* (US); Oroya, *Kalenborn 144* (NY, US); Rimac, 1882, *Ball* (G); San

Damian, 2400–3000 m. alt., 1913, *Hrdlicka* (US); Lima, 150 m. alt., *Macbride & Featherstone 61* (G, FM); Lima, purchased in market, *Cook & Gilbert 2086* (US); Huanuco, 2100 m. alt., *Macbride & Featherstone 2062* (G, FM). ECUADOR: Chuquiribamba, *André 3980* (NY, FM); Azogues, *Rose & Rose 22800* (US); Cuenca, *Rose, Pachano & Rose 22927* (US).

3. OE. MULTICAULIS R. & P. Fl. Peruv. iii. 80, t. 317 (1802). *Xylopleurum multicaule* Loesener in Fedde, Repert. xii. 237 (1913). *Oe. multicaulis*, var. *petiolaris* Ball, Jour. Linn. Soc. xxii. 38 (1885). *Oe. Barbeyana* Lévl. Monog. 43, cum tab. (1902). *Hartmannia boliviana* Rusby, Descr. S. Am. Pl. 72 (1920).—Bolivia to southern Eucador.—BOLIVIA: Songo, *Bang 914* (G, NY, FM, Mo, US, Ph, ISOTYPES of *Oe. Barbeyana* Lévl.); near Sorata, 4000 m. alt., *Mandon 632* (G, NY); Titicaca Island, 3840 m. alt., *Buchtien 2922* (NY, TYPE of *H. boliviana* Rusby; US, ISOTYPE). PERU: Puno, 3125 m. alt., *Shepard 147* (G); Cuzco, *Rose 19489* (US); Ollantaytambo, 3000 m. alt., *Cook & Gilbert 345* (US), *1901* (US); Obrajillo, *Wilkes Exped.* (G, US); 25 km. S. E. of Huanuco, 3150 m. alt., *Macbride & Featherstone 2136* (G, FM); Rio Blanco, 3600 m. alt., *Macbride & Featherstone 746* (G, FM); Cuzco, 3000–3600 m. alt., 1923, *Herrera* (US). ECUADOR: Zaragura, *Rose, Pachano & Rose 23163* (G, NY, US); (? immature) Cuenca, *Rose, Pachano & Rose 22942* (US).—Very variable in the form and size of fruit. The only definite character capable of decisively separating it from the more northern plant usually referred to *Oe. tarquensis* HBK. appears to be the larger size of the seeds. The Bolivian and Peruvian material available has seeds averaging much larger than that from further north, with the exception of one fruiting collection from southern (Zaragura) Ecuador, which has seeds indistinguishable from typical *Oe. multicaulis*. While usually indicative, the other characters mentioned in the key are not at all constant.

3a. **Oe. multicaulis**, var. **tarquensis** (HBK), comb. nov. *Oe. tarquensis* HBK. Nov. Gen. et Sp. vi. 91 (1823). *Hartmannia tarquensis* Spach, Nouv. Ann. Mus. Paris iv. 363 (1835). *Oe. ascendens* Willd. in Spreng. Syst. ii. 230 (1825).—Central Ecuador to Venezuela; also in Mexico.—ECUADOR: near Quito, *Orton* (G), *Rose & Rose 23533* (G, NY, US), *Holway 939* (US), *Jameson 26* (NY) and *355* (G); Pichincha, 3000 m. alt., 1855, *Couthouy* (G, Y, NY), *Jameson 119* (NY); Ambato, *Pachano 191* (US); San Francisco, 15 km. N. E. of Ambato, 2550 m. alt., *Tate 563* (US); Baños, prov. of Tungurahua, 1950 m. alt., *Tate 612* (US); Tulcán, Prov. Carchi, 2500 m. alt., *Hitchcock 20998* (US, NY); without locality, *Spruce*

5059 (G), *Jameson* (US). COLOMBIA: Coconuco, Dept. El Cauca, 2300–2500 m. alt., *Killip 6844* (NY, US); Huancabamba, *André K1054* (FM); Bogota, 2600–2700 m. alt., *Pennell 2330* (G, NY, US); Bogota, *Holton 890* (G, NY); Zipacon, Dept. Cundinamarca, 2500 m. alt., *Rusby & Pennell 1216* (NY, US). VENEZUELA: Paramo de Santo Domingo, Mérida, 3600 m. alt., *Jahn 1093* (US); Paramo de La Sal, Mérida, 3400 m. alt., *Jahn 593* (US).—This variety is quite indistinguishable from *Oe. cuprea* Schlecht., Linnaea xii. 269 (1838), from the high volcanoes of southern Mexico and Guatemala. In fact some of the cited material has been distributed under that name.

4. OE. PUNAE Kuntze, Rev. Gen. iii. pt. 2, 99 (1893). *Raimannia punae* Sprague & Riley, Kew Bull. 201 (1921). *Oe. Mandoni* Lévl. Monog. 43 (1902); 359 (1909). *Oe. Kuntziana* Lévl. Monog. 43, cum tab. (1902); 359 (1909).—Western Bolivia and adjacent Peru.—BOLIVIA: Escayarhe near Tarija, *Frebrig 3030* (Mo); La Paz, 3900 m. alt., *Buchtien 644* (US, NY); La Paz, 4000 m. alt., *Mandon 631* (NY, ISOTYPE of *Oe. Mandoni* Lévl.); Nyuni, 3700 m. alt., *Asplund 5981* (US); Challapata, 3900 m. alt., *Asplund 5982* (US); Guagui, 3900 m. alt., *Asplund 5983* (US). PERU: Puno, prov. Huancané, *Shepard 86* (G).—Although Léveillé insists, l. c. 43 and 359, that his *Oe. Mandoni* was published simultaneously with Kuntze's *Oe. punae*, and that Kuntze had admitted the fact, we have been unable to discover a publication of the name *Oe. Mandoni* earlier than 1902, about nine years after the launching of *Oe. punae* Kuntze. Judging from description this species is closely related to, if not identical with, *Oe. nana* Griseb., Abhandl. Gesellsch. Wiss. Goett. xix. 143 (1874), a species occurring in the high country of northern Argentina.

5. **Oe. Featherstonei**, sp. nov., perennis; caulibus prostratis frutescentibus 4–7 mm. crassis apicem versus ascendentibus 2–3 dm. altis in partibus junioribus minute canescente pubescentibus; foliis numerosis 1–3 cm. longis 3–8 mm. latis lanceolatis concoloribus puberulentis remote dentatis apice acutis basim versus in petiolum 1–4 mm. longum attenuatis, superioribus vix reductis; floribus ut videtur paucis axillaribus conspicuis; hypanthio 25–30 mm. longo canescente minuteque pubescenti subtubiformi; sepalis ca. 15–17 mm. longis extus dense minute pubescentibus cum apicibus corniculatis 2 mm. longis conspicuis ornatis; petalis flavis late triangulari-obovatis ca. 22–25 mm. longis et latis apice truncato-obtusis basim versus gradatim contractis; staminibus subaequalibus; filamentis filiformibus 13–14 mm. longis; antheris 6–7 mm. longis linearibus medium versus dorsaliter affixis; stylo infra medium pu-

bescenti ca. 4 cm. longo cum stigmate 4-lobato coronato; lobis stigmatis teretibus ca. 2 mm. longis; capsulis sessilibus 23–25 mm. longis obtuse quadrangularibus rectis vel falcatis saepe ascendentibus supra medium saepe incrassatis ca. 3.5 mm. crassis; seminibus ca. 1.5 mm. longis brunneis vix variolatis ellipsoideis nullo modo angulatis.—PERU: sprawling on disintegrated granite slope, Matucana, Lima, *Macbride & Featherstone 270* (TYPE, Field Mus. no. 516,803; ISOTYPE, Gray Herb.).—Obviously a member of the § *Raimannia*, but very different from the middle and northern Andean species in its woody perennial habit and large flowers. It seems rather closely related to the confused and poorly understood group of pampean species although it is rather far removed from them geographically.

6. OE. LACINIATA Hill, Veg. Syst. xii. 64 (1767); Hort. Kew. 172[4] cum tab. (1769). *Oe. sinuata* L. Mant. ii. 228 (1771). *Oe. prostrata* R. & P. Fl. Peruv. iii. 79, t. 315 (1802). *Oe. psychrophila* Ball, Jour. Linn. Soc. xxii. 38 (1885). *Oe. Stuebelii* Hieron. in Engler, Jahrb. xxi. 327 (1895).—Peru and Ecuador; widely distributed in Mexico and eastern United States.—PERU: near Lima, 1882, *Ball* (G); Baños, *Wilkes Exped.* (US); Mito, Prov. Huanuco, 2700 m. alt., *Macbride & Featherstone 1528* (G, FM); Chacapoyas, *Matheus* (NY); Rimac, 1500–1600 m. alt., 1882, *Ball* (NY); Rimac, 1200 m. alt., 1887, *Safford* (NY); without locality, 1862, *Matheus* (NY); without locality, *Wilkes Exped.* (US, NY). ECUADOR: Cotocollas, *Mille 398* (US); Quito, *Hartweg 982* (NY); Quitensian Andes, 1855, *Couthouy* (G, NY); Andes, *Spruce 5039* (G).—A careful comparison of material from North and South America has failed to reveal any characters by which the plants from the two continents can be distinguished nor any reason for recognizing the proposed segregates among the southern plants.

6a. **Oe. laciniata**, var. **limensis**, var. nov., differt a forma typica floribus minoribus; petalis 7 mm. longis; hypanthio 10–12 mm. longo; seminibus flavescentibus.—PERU: on sandy hills along the sea, Lurin, Lima, *Macbride 5950* (TYPE, Field Mus. no. 536,954; ISOTYPE, Gray Herb.).—A peculiar variation of *Oe. laciniata* characterized by its small flowers and yellowish seeds.

7. **Oe. arequipensis**, sp. nov., annua herba erecta simplex foliosa villosa saepe rubro-tincta 10–25 cm. alta; foliis 2–3 cm. longis 5–9 mm. latis subsessilibus lanceolatis vel lineari-lanceolatis valde irregulariterque dentatis concoloribus; floribus in axillis omnibus etiam ab infimis ad summa gestis; alabastro erecto ellipsoideo-obovoideo villoso 6–7 mm. longo; hypanthio 14–15 mm. longo subtubulari quam

lato 10-plo longiori; sepalis 5–7 mm. longis anthesi separatim reflexis lanceolatis apicem versus 1–2.5 mm. longe corniculatis; petalis ca. 4–6 mm. longis suborbicularibus flavis (?) in sicco rosaceis; filamentis compresse filiformibus subaequalibus ca. 4–5 mm. longis; antheris ca. 2 mm. longis oblongis dorsaliter medium versus affixis; stylo glabro ca. 17–18 mm. longo; stigmate 4-lobato lobis ligulatis ca. 2 mm. longis; capsulis 15–20 mm. longis ca. 3.5 mm. crassis obtusi-quadrangularibus basim et apicem versus abrupte contractis subsessilibus cum valvis medialiter longitudinaliterque costatis; seminibus ascendentibus biseriatis ovoideis brunnescentibus ca. 1 mm. longis variolatis.—PERU: sandy slopes, desert hills, Mollendo, Arequipa, *Hitchcock 22403* (TYPE, U. S. Nat. Herb. no. 1,196,655).—Although eventually this peculiar plant may prove to be only a phase of *Oe. verrucosa* it differs in so many respects from that species that it seems best to treat it here as a distinct species. We doubtfully refer to this species a single dwarf specimen in the National Herbarium that was collected at Luisa, Ecuador, by Rose & Rose (no. 23907). It differs from the type of *Oe. arequipensis* in being subacaulescent and in having more nearly entire leaves and less well developed sepal-tips. The plant mentioned is a peculiar one and more material of it is a great desideratum.

8. OE. VERRUCOSA Johnston, Contr. Gray Herb. n. s. lxx. 77 (1924). —PERU: southern slope of El Chachani near Arequipa, *Hinckley 17* (G, TYPE).—No further information regarding this species has accumulated since its recent publication.

9. **Oe. fusiformis**, sp. nov., herbacea ut videtur perennis; caulibus canescentibus minute pubescentibus et sparse villosis teretibus; foliis superioribus lanceolatis ca. 10 cm. longis 15 cm. latis minute pubescentibus pallidis concoloribus margine irregulariter undulatis apice acutis basim versus in petiolum ca. 5 mm. longum attenuatis; floribus spicatis flavis bracteatis; bracteis lanceolatis sessilibus 1–3 cm. longis; ovario cylindrico glandulari-pubescenti ca. 1 cm. longo; hypanthio ca. 4 cm. longo ca. 1 mm. crasso graciliter tubuloso glandulari-pubescenti; sepalis 3–3.5 cm. longis lanceolatis bini reflexis extus glandulari-pubescentibus, apicibus ca. 2 mm. longis erectis teretibus; petalis flavis 4–5 cm. longis 3–4 cm. latis obovatis basi attenuatis apice obtusis vel rotundis; staminibus 8 aequalibus; filamentis filiformibus ca. dimidium petalorum aequantibus; antheris linearibus dorsaliter medialiterque affixis ca. 13 mm. longis; stylo 7.5–8.5 cm. longo glabro; stigmate 4-partito lobis linearibus 8 mm. longis; capsulis fusiformibus 3–4 cm. longis 4–5 mm. crassis sessilibus sparse

pubescentibus brunnescentibus obtuse quadrangularibus apice 3–5 mm. longe rostratis cum valvis medialiter longitudinaliterque costatis; seminibus angulatis brunneis ca. 2 mm. longis.—ECUADOR: field between El Tambo and La Toma, Prov. Loja, 1000–2200 m. alt., *Hitchcock 21350* (TYPE, U. S. Nat. Herb. no. 1,196,309).—Among South American species well characterized by its large flowers, fusiform capsules and angled seeds.

10. OE. RUBIDA Rusby, Bull. N. Y. Bot. Gard. viii. 110 (1912).—PERU: Arequipa, 2250 m. alt., *Williams 2524* (NY, TYPE); slopes of El Chachani north of Arequipa, 2400 m. alt., *Hinckley 68* (US).—Apparently a local species and perhaps too close to one of the following.

11. OE. ELONGATA Rusby, Mem. Torr. Bot. Cl. iii. 33 (1893). *Oe. serratifolia* Krause in Fedde, Repert. i. 168 (1905).—BOLIVIA: vicinity of La Paz, 3300 m. alt., *Bang 54* (NY, TYPE; G, Ph, US, Mo, ISOTYPES); La Paz, 3550 m. alt., *Buchtien 77* (G, NY, FM); La Paz, 3550 m. alt., *Buchtien 39* (US).—We know *Oe. serratifolia* only from description. The type of this apparently synonymous species came from extreme southern Bolivia in the vicinity of Tarija.

12. OE. CAMPYLOCALYX Koch & Bouché, Ind. Sem. Hort. Berol. app. 17 (1855). *Oe. versicolor* Lehm. Ind. Sem. Hort. Hamb. 7 (1855); Linnaea xxviii. 359 (1856). *Oe. coccinea* Britt. Bull. Torr. Bot. Cl. xvii. 213 (1890). *Oe. scabra* Krause in Fedde, Repert. i. 168 (1905). *Oe. Weberbaueri* Krause, l. c. 169. *Onagra fusca* Krause, l. c. 167. *Oe. fusca* Sprague & Riley, Kew Bull. 1921: 199 (1921).—Ecuador to Peru and northern Argentina.—BOLIVIA: Tarija, *Fiebrig 3358* (G); Ingenio del Oro, 3000 m. alt., *Rusby 1815* (NY, TYPE of *Oe. coccinea*); *Rusby 1976* (NY); Sorata, 2650–3000 m. alt., *Mandon 627* (G); Titicaca Island, 3840 m. alt., *Buchtien 4661* (US), *2921* (NY, US); La Paz, 3800 m. alt., *Buchtien 532* (US); Cochabamba, 2700 m. alt., *Buchtien 2387* (US); "Rio Juntas," 2000 m. alt., *Kuntze* (NY). PERU: Ollantaytambo, 3000 m. alt., *Cook & Gilbert 628* (US), *294* (US); Oroya, 3300–3600 m. alt., *Kalenborn 241* (NY, US); Cuzco, 3000–3600 m. alt., *Herrera* (US); Rio Blanco, 3600 m. alt., *Macbride & Featherstone 681* (G, FM), *721* (FM, G); Yanahuanca, 3000 m. alt., *Macbride & Featherstone 1250* (G, FM); Huacachai near Muña, 1950 m. alt., *Macbride 3884* (G, FM). ECUADOR (?): Guanojo, *André* 3965 (NY).—This species appears to be the most common evening primrose in Peru and Bolivia. It is readily recognized by its very thick short capsules and usually reddish petals. Léveillé, under the name of *Oe. Simsiana*, has given a photograph of a quite typical specimen. *Oenothera sandiana* Hassk., Flora

xxxix. 516 (1856), from near Sandia in extreme southeastern Peru may prove to be a synonym of this species although the fruit is described as subcylindrical.

Excluded and Unidentified Species.

Oe. perampla Graham, Edinb. New Philos. Journ. 1832: 362 (1832).—Given as probably collected [by Cruckshanks] near Lima. Judging from the lengthy description, this species is a synonym of Oe. acaulis Cav., a Chilean species widely distributed in the region in which Cruckshanks is known to have collected.

Oe. pubescens Willd. in Spreng. Syst. ii. 229 (1825).—"*Amer. aust.* Humb."—Unrecognized. Perhaps a species of *Jussiaea*.

Oe. fruticosa L. is reported from Ecuador by Léveillé, Monog. 106 (1902), but we have seen nothing suggesting it from South America.

III. FURTHER NEW PLANTS COLLECTED BY MRS. RICHARD C. CURTIS IN TROPICAL AFRICA.

By Ivan M. Johnston.

In a former paper, Contr. Gray Herb. n. s. lxxiii. 31–40, there were described some novelties found in a highly interesting collection secured by Mrs. Richard C. Curtis of Boston while accompanying a hunting expedition to the interior of Angola and Kenya. Subsequent study of some of the more technical plants of the same series has disclosed the following four species which have not been identified with any as yet described.

Rhynchotropis Curtisiae, sp. nov., herbacea 2–2.5 dm. alta canescens; radice perenni; caulibus pluribus gracilibus laxe ramosis ascendentibus 4-angulatis adpresse pubescentibus; stipulis lanceolatis herbaceis subcaducis acutis 2–5 mm. longis 0.5–1 mm. latis pubescentibus saepe reflexis; foliis 2–3 cm. longis 7–11 mm. latis oblongis vel oblongo-ovatis concoloribus dense adpresse pubescentibus integerrimis alternis apice obtusis vel acutis basi rotundis vel obtusis sessilibus supra enervatis subtus cum nervis prominentibus; racemis axillaribus folia multo superantibus dissitifloris 5–20 cm. longis; bracteis setaceis deciduis 2–3 mm. longis ascendentibus; pedicellis ad anthesin 2–5 mm. longis fructiferis 3–7 mm. longis canescente pubescentibus; calyce 5-laciniato 4–5 mm. longo dense adpresse pubescenti, lobis

subulato-lanceolatis ca. 2.5 mm. longis; corolla rubra; vexillo obtuse quadrangulato 5–6 mm. lato ca. 6 mm. longo glabro; alis ca. 7 mm. longis ca. 3 mm. latis; carina falcata 7–8 mm. longa apice in rostrum rectum producta glabra; staminibus 10 diadelphis alternis brevioribus glabris; antheris orbiculari-oblongis ca. 0.4 mm. longis margine sparse villosulis apice glabratis mucronatis basi cum appendicula scariosa oblonga 0.2–0.3 mm. longa pendula ornatis; stylo glabro falcato; stigmate cymbiformi; leguminibus linearibus 2.5–3.5 cm. longis 1.7–2 mm. latis dense pubescentibus apicem versus uncinato-curvatis.—KENYA: Mau Range, about 70 km. S. W. of Kijabe, July 25, 1923, *Anita G. Curtis 814* (TYPE, Gray Herb.). In consequence of its dilated boat-shaped stigma, rostrate keel, simple leaves, and basally appendaged anthers this species falls into Harms's genus *Rhynchotropis*, Engler's Jahrb. xxx. 86 (1901), a critical group segregated from *Indigofera*. Although I am personally inclined to suspect that the group might better be treated as a subgenus of *Indigofera* I am describing Mrs. Curtis's very distinct species under *Rhynchotropis* because Baker, Jour. Bot. xli. 185 (1903), who studied all the numerous African Indigoferas, has agreed with Harms in excluding the group from *Indigofera*.

From the two other species of the genus, *R. Poggei* of the upper Congo region and *R. Dekindtii* of southern Angola, *R. Curtisiae* differs, in addition to its widely separated range, in its shorter and broader leaves, narrower legumes, and entirely glabrous oblong anther-appendages. Harms, l. c., describes the anthers of the other species as barbellate apically and basally, just as illustrated by Taubert, Pflanzenf. iii. Abt. 3, 260, fig. 115h–k (1894). The apex of the anthers in *R. Curtisiae* has a glabrous mucronate connective quite like that in species of *Indigofera*. The appendages at the base of the anthers in the proposed species are oblong, scarious and entire-margined, and are half to nearly as long as the body of the anther. They are not at all pubescent or lacerate.

Ekebergia pumila, sp. nov., fruticulosa 1–2.5 dm. alta e rhizomate horizontali gracili fruticoso late crasseque squamoso oriens; caulibus simplicibus erectis 5–15 cm. longis paucifoliatis puberulentis; foliis imparipinnatis, rhachi 5–9 cm. longa alata puberulenta basim foliolorum versus inconspicue glandulosa, foliolis firmis 3–4-jugis oppositis lanceolatis 3–5 cm. longis 9–12 mm. latis glabratis integerrimis obscure venosis sessilibus subtus pallidioribus (vel juventate glaucis) supra viridibus apicem versus acute attenuatis basim versus aequaliter attenuatis, terminali oblanceolato acuto 4–5 cm. longo basim versus

valde attenuato; panicula terminali congesta 1–2 cm. diametro pluriflora minute pubescenti; petalis 5 oblongis obtusis 2.5–3 mm. longis extus pubescentibus in alabastro paullo imbricatis; calyce ca. 1.2 mm. alto crassiusculo sparse pubescenti; lobis 5 ovatis acutis ca. 1 mm. altis; tubo stamineo urceolato ca. 1.7 mm. alto extus supra villoso margine dentato (dentibus antheriferis); antheris 10 subexsertis oblongis apiculatis; ovario piloso 2(?)-loculis; stylo glabro; bacca ca. 8 mm. diametro globosa glabra rubescenti monosperma.—ANGOLA: Giant Sable Country, between the Cuanza and Loando rivers, Sept. 20–22, 1923, *Anita G. Curtis 258* (TYPE, Gray Herb.), *237*, *291*.—Readily separable from all the described members of its genus by the presence of alate leaf-rhachises and low stems arising from a horizontal caudex. Its congeners are shrubs or trees.

Lactuca tinctociliata, sp. nov., perennis 3–5.5 dm. alta; caulibus glaberrimis paullo glaucescentibus 1–2 mm. crassis teretibus simplicibus vel supra medium paullo stricte ramosis e radice ca. 12 mm. crasso recto simplici erumpentibus; foliis concoloribus margine purpureo-callosis integerrimis vel dentatis vel subulato-ciliatis costa subtus prominenti saepe purpureo-hispidis, caulinis paucis alternis caulis in partibus inferioribus gestis lanceolato-linearibus sessilibus 4–7 cm. longis 3–4 mm. latis, superioribus gradatim valde reductis, radicalibus lineari-oblanceolatis 5–7 cm. longis 2–7 mm. latis basi in petiolum purpureo-tinctum alatum 1–2 mm. latum attenuatis; inflorescentia saepe cymosa cum bracteis lanceolatis minutis 1–3 mm. longis ornatis paucicapitulatis; capitulis late cylindraceis 12–14 mm. altis 6–7 mm. crassis 1–7 mm. longe pedunculatis; tegulis acutis apicem versus villosulis, exterioribus anguste ovatis vel ovato-lanceolatis inaequalibus ca. 6 ca. 1–6 mm. longis plus minusve recurvatis, interioribus lanceolatis 10–12 mm. longis aequalibus; corollis flavis ca. 12 ca. 13–15 mm. longis, tubo ca. 5 mm. longo albo gracili, lamina oblonga ca. 10 mm. longa ca. 2.5 mm. lata tegulis 5–6 mm. longiori; achaeniis valde compressis oblongo-ovatis vel oblanceolatis 5–6 mm. longis supra in rostrum gracile ca. 1 mm. longum attenuatis basi obscure substipitatis scabridulis, costis ca. 12, marginalibus et centralibus crassioribus; pappi setis albis 5–7 mm. longis antrorse scabridulis.—ANGOLA: Giant Sable Country, between the Cuanza and Loando rivers, Sept. 1923, *Anita G. Curtis 315*, *218*, *283* (TYPE, Gray Herb.).—Very well characterized by its narrow firm purple leaf-margins which commonly bear purplish-tinged teeth and fleshy cilia. I can find no described *Lactuca* that appears to be closely related to the one proposed here.

Lactuca Varianii, sp. nov., glaberrima ca. 4.5 dm. alta perennis; caulibus compluribus erectis herbaceis striatis paullo glaucescentibus ca. 2 mm. crassis aphyllis pauciramosis e radice crassa erecta orientibus; ramis strictis cum bracteis triangularibus brunnescentibus ca. 3 mm. longis suffultis; foliis rosulatis oblanceolatis ca. 6–8 cm. longis ca. 10–12 mm. latis basi attenuatis enervosis ad anthesin deciduis; capitulis numerosis cymosis 5–30 mm. longe pedunculatis anguste cylindraceis 15–18 mm. altis ca. 3–3.5 mm. crassis; tegulis glaberrimis, exterioribus inaequalibus 1–3 mm. longis 1–1.5 mm. latis ovatis acutis 5–7, interioribus aequalibus 5 linearibus obtusis 14–16 mm. longis saepe ca. 1.7 mm. latis margine anguste scariosis in sicco atratis; floribus 10–13 ca. 15–18 mm. longis, tubo gracili 5–6 mm. longo glabro, lamina ca. 2.3 mm. lata valde dentata tegulis ca. 4 mm. longiori; achaeniis compressis anguste lanceolatis 6 mm. longis pallidis ca. 0.8 mm. latis ca. 12-costatis supra in rostrum crassiusculum 1 mm. longum attenuatis antrorse scabridulis stramineis; pappi setis 6–7 mm. longis albis sparse antrorse scabridulis.—ANGOLA: Giant Sable Country, between the Cuanza and Loando rivers, Sept. 20, 1923, *Anita G. Curtis 225* (TYPE, Gray Herb.); Dondé, Bailundo, Sept. 9, 1923, *Anita G. Curtis 167*.—Related to *L. Verdickii* De Wild., Annal. Mus. Congo, Bot., ser. 4, 170, t. 28 (1903), of Katanga, from which it differs in its five tegules, and larger, more attenuate, more abundantly ribbed achenes. The two collections of *L. Varianii* are more erect than the plant of *L. Verdickii* figured by De Wildeman, but otherwise are quite similar in gross habit. Recently R. E. Fries, Acta Hort. Bergiani viii. 113 (1924), transferred *L. Verdickii* to the genus *Sonchus*. The mature achenes of *L. Varianii* are strongly compressed, as much so as those of *L. Verdickii* figured by De Wildeman, and hence the species is launched as a member of *Lactuca*. It is noteworthy, however, that in habit *L. Varianii* seems very similar to the species that Fries, l. c. 92, associates to form the *Sonchus rarifolius*-group.

In accord with a suggestion of Mr. C. P. Curtis this species has been named for Captain H. F. Varian, chief engineer of the Benguella Railroad, to whose hospitality and effective aid the success of the Angola hunting and collecting trip is largely attributed.

IV. SOME UNDESCRIBED AMERICAN SPERMATOPHYTES.

By Ivan M. Johnston.

Acacia Brandegeana, sp. nov., fruticosa 2–3 m. alta; ramis brunneis flexuosis conspicue verrucosis cum spinis rectis brevibus geminatis subulatis armatis juventate pubescentibus; foliis in axibus secondariis brevissimis ad axillas spinorum congestis pubescentibus, petiolis 2–5 mm. longis cum glandula deltoidea concava terminatis, pinnis 1-jugatis 8–12-foliolatis 1–2 cm. longis, foliolis 3–6 mm. longis oblongis coriaceis opacis venosis obtusis sed mucronulatis basi obliquis; spicis cylindricis laxis breviter pedunculatis quam folia saepe longioribus ca. 2.5 cm. longis; calyce paullo inflato ca. 1 mm. longo, lobis deltoideis margine furfuraceis vel hispidis; petalis obovatis obtusis calycem paullo superantibus; staminibus numerosis ca. 2 mm. longis; legumine falcato brunneo canescenti-pubescenti compresso 4–6 mm. lato 4–11 cm. longo striato inter semina plus minusve contracto; seminibus atris oblongis compressis ca. 7 mm. longis 4 mm. latis.—Lower California: a large thorny shrub forming thickets along a wash, Agua Verde Bay, *Johnston 3881* (type, Gray Herb.).—This *Acacia* is widely distributed over the southern half of the peninsula of Lower California and in the past has gone as *A. amentacea* DC. It is most closely related to that species, but differs in its smaller, more numerous, dull, pubescent leaflets, and canescent legumes. It also has a widely separated range. *Acacia amentacea* occurs east of the continental divide in northeastern Mexico, whereas *A. Brandegeana* is endemic to Lower California. In a recent paper, Proc. Calif. Acad. Sci. ser. 4, xii. 1031 (1924), I treated the plant as *A. sonorensis* Rose, but the type of that species proves it to be a very close relative of *A. californica* Brandg. The species is named in honor of the late Townshend Stith Brandegee who made numerous collections of it and suspected its distinctness. I find it a pleasure to associate Mr. Brandegee's name with one more plant of that flora for the knowledge of which he did so much.

Mabea Macbridei, sp. nov., arbuscula; ramulis gracilibus subangularibus olivaceis primo puberulentis mox glaberrimis; foliis oblongis vel elliptico-oblongis 12–18 cm. longis 4.5–6 cm. latis glaberrimis margine leviter crenatis supra nitidis subtus glaucis cum venis conspicuissimis ca. 30 liniatis marginem versus minute glandulosis apice obtusis abrupte acuminatis basi rotundatis vel obtusis eglandulosis; petiolis 9–12 mm. longis; paniculis terminalibus ferruginoso-tomentosis ca. 10 cm. longis 10–12 mm. latis cum bracteis lanceolatis

ornatis, ramulis pistillatis ca. 1 mm. longis unifloris, ramulis staminalibus 1–2 mm. longis umbellatim 2–4-floris ad imam basem inconspicue glandulosis; pedicellis pistillatis ca. 7 mm. longis canescente strigosis; sepalis pistillatis orbicularibus vel acute ovatis canescente pubescentibus ca. 1–1.5 mm. longis eglandulosis; ovario tomentoso inermi; columna stylari 5–7 mm. longa; parte libera stylorum 5–7 mm. longa; pedicellis florum staminalium gracilibus 5–10 mm. longis; calyce staminali ca. 2 mm. lato, lobis ovate deltoideis; staminibus 15–25; antheris fere sessilibus sparse pubescentibus.—PERU: Hacienda Schunke, La Merced, Dept. Junin, 1200 m. alt., *Macbride 5702* (TYPE, Field Mus. no. 536,733).—Probably most related to the Peruvian *M. maynensis* Müll. Arg. from which it differs in its narrow tomentose panicle, shorter staminate peduncles provided with small basal glands, smaller flowers, and row of submarginal glands on the under leaf-surface. The peculiar submarginal row of glands serves to distinguish the plant from all the South American species except *M. nitida* Benth., a species readily separated by its inflorescence, peduncle-glands, etc.

Acalypha Macbridei, sp. nov., fruticosa laxa ca. 9 dm. alta dioeca; ramulis teretibus ca. 3 mm. crassis minute strigosis in partibus junioribus dense canescenter strigosis; foliis firmiter herbaceis glabratis penninervatis late oblanceolatis vel oblongo-lanceolatis 15–23 cm. longis 2.5–5 cm. latis apice attenuato-acuminatis basi obtusis margine inconspicue crenatis supra asperulis subtus subpallidioribus cum venis primariis 15–25 sparse adpresseque villosis prominentibus; petiolis 5–8 mm. longis dense canescenter strigosis; stipulis lanceolatis minutis deciduis ca. 2 mm. longis canescentibus; racemis staminalibus ignotis; racemis pistillatis axillaribus filiformibus 8–16 cm. longis dissitifloris spiciformibus strigosis breviter pedunculatis quam folia brevioribus; bracteis minutis ovato-lanceolatis 1–3-floris; floribus pistillatis vix 1 mm. longe graciliter pedicellatis, sepalis 5 acuti-ovatis glanduloso-denticulatis; ovario dense papilloso; stylo ca. 2.5 mm. longo e basi oblonga divergenter 15–20-laciniato; capsula ignota.—PERU: Pampayacu, hacienda at mouth of Rio Chinchao, Dept. Huanuco, *Macbride 5093* (TYPE, Field Mus. no. 536,144; ISOTYPE, Gray Herb.).—In the recent monograph of *Acalypha* by Pax & Hoffmann, Pflanzenr. iv. Fam. 147, pt. 17 (1924), this species fits into the section *Axillaris* of the subgenus *Terminales*, and is apparently nearest *A. subandina* Uline. From that species, however, it differs in its short petioles, and shorter spicate-racemose rather than paniculate inflorescence.

Acalypha fulva, sp. nov., fruticosa ca. 5 dm. alta; ramulis teretibus satis robustis fulvis cum setis simplicibus glandulosis 2–3 mm. longis villoso-hirsutis; stipulis reflexis lanceolato-subulatis 6–8 mm. longis persistentibus subscariosis glabratis apicem versus glandulosis; foliis ovatis acuminatis serratis 12–36 cm. longis 9–18 cm. latis supra viridibus villosis sparse stipitato-glandulosis inconspicue punctatis subtus pallidioribus in costa nervisque divergenter villoso-hirsutis basi palminerviis profunde cordatis cum auriculis latis valde imbricatis; petiolis 5–15 cm. longis fulvis cum setis glandulosis villoso-hirsutis; spiculis axillaribus androgynis 6–15 cm. longis fulvis glanduloso-pubescentibus 1 cm. supra basem cum bracteis pistillatis 1–2 cordatis ovatisve acutis acuminatisve sessilibus 10–12 mm. longis 11–16 mm. latis unifloris multiplicatis 20–30-dentatis ornatis; sepalis pistillatis oblongo-ovatis glanduloso-ciliatis; ovario dense stipitato-glanduloso et pubescenti; stylis 7–9 mm. longis profunde 10–15-laciniatis.—PERU: Muña, Dept. Huanuco, 2100 m. alt., *Macbride 4011* (TYPE, Field Mus. no. 535,075; ISOTYPE, Gray Herb.).—Belonging to the group *Oligogyne* § *Cuspidatae*, but readily separated from the described members of that section by the gland-tipped pubescence, and deeply cordate leaves with closed sinuses. Mr. Macbride notes that the plant is "pungently resinous."

Sloanea amplifrons, sp. nov., arbor 9 m. alta; ramis crassis angulatis paucis elongatis superne cinnamomeo-tomentellis; foliis alternis amplis subcoriaceis 2–5 dm. longis 1–3 dm. latis ellipticis vel obovatis apice acutis obtusisve basi saepe subcordatis rare rotundis vel obtusis margine sinuato-dentatis subtus pallidioribus et minute puberulentis; petiolo 8–15 cm. longo apice valde incrassato et canaliculato; stipulis persistentibus ascendentibus strictisve irregulariter inciso-dentatis 2–4 cm. longis navicularibus; inflorescentia axillari racemosa 8–15 cm. longa cum bracteis eroso-dentatis 10–15 mm. longis ornata; calyce cyathiformi irregulariter 5–10-dentato extus cinereo-tomentello 4–6 mm longo 6–10 mm. diametro quarta vel quinta parte dentato 2–3 mm. longe pedicellato; staminibus calycem superantibus; filamentis perbrevibus; antheris tetragonis pilosis obtusis libris; pistillo staminibus $1\frac{1}{2}$–2-plo longiore; ovario 4-loculari densissime villoso in stylum simplicem pilosum continuo; capsula globosa uniloculari monosperma ca. 15 mm. diametro cum setis gracilibus scabris curvatis numerosissimis 20–35 mm. longis ornata; fructu (i. e. capsula cum setis) 4.5–5.5 cm. diametro spongioso.—CAYENNE: without locality, *Martius* (G). SURINAM: without locality, *Hostmann 1025* (G). BRITISH GUIANA: Kartabo Region, *Bailey 37* (G); Koreai Creek, *Linder 158* (TYPE,

Gray Herb.); Anabisi River, Northwest District, *La Cruz 1364* (NY); Waroowaro Creek, Pomeroom River, *Jenman 7787* (NY). VENEZUELA: Eleanor Creek, lower Orinoco, *Rusby & Squires 260* (G, NY).—The plant here described in the main appears to be the *Sloanea dentata* of the Flora Brasiliensis, xii, pt. 3, 178, t. 37 (1886). As Urban, Fedde Repert. xv. 321 (1918), has pointed out, *S. dentata* L. is strictly West Indian being based on a Plukenet specimen probably from Martinique. A study of the matter seems further to indicate that *S. dentata* L. has a synonym in *S. Massoni* Sw., and that the Linnean name should apply to the concept treated as *S. Massoni* in the Flora Brasiliensis. There can be no doubt that the South American plant described here as *S. amplifrons* is distinct from the West Indian *S. dentata* L. Among its group of immediate relatives, those with broad leaves and persistent stipules, it is readily recognized by its fruit and cyathiform calyx. The capsule is covered with exceedingly numerous, long, very slender, antrorsely scabrous and tortuous appendages. These are flexuous near their tips and more or less intertangled to form a spongy mass. The related species all have relatively few, straight, coarser, glabrous capsule-appendages, and parted calyces. According to Professor I. W. Bailey the plant is a myrmecophyte, ants using as dometia the large boat-shaped stipules which are strictly appressed to the stem.

Fouquieria Digueti (Van Tieghem), comb. nov. *Bronnia Digueti* Van Tieghem, Jour. de Bot. xiii. 297 (1899). *B. Thiebauti* Van Tieghem, l. c. *F. peninsularis* Nash, Bull. Torr. Bot. Cl. xxx. 455. (1903); Johnston, Proc. Calif. Acad. ser. 4, xii. 1099 (1924).—There can be no doubt that Van Tieghem's two species are synonymous with each other and with the later *F. peninsularis* of Nash.

Fuchsia perbrevis, sp. nov., glabrata; foliis oppositis ovatis vel elliptico-oblongis 4–10 cm. longis 2.5–3.5 cm. latis apicem et basim versus attenuatis margine evidenter dentatis supra brunneis glaberrimis subtus pallidioribus cum costa et nervis brunnescentibus puberulentis prominentibus; petiolis 2–6 mm. longis; stipulis firmis subpersistentibus triangularibus 1–2 mm. altis; floribus coccineis axillaribus paucis; ovario glaberrimo 10–12 mm. longo angulato oblongo-cylindrico ca. 2 mm. crasso basim versus in pedicellum 1–1.8 cm. longum nutantem crassiusculum attenuato supra vix attenuato; hypanthio 3–4(–5) mm. longo basim versus 2–2.5 mm. crasso apicem versus 3.5–5 mm. crasso intus et extus glaberrimo gradatim ampliato; sepalis ca. 1 cm. longis oblongis vel oblongo-lanceolatis acutis vel attenuatis ascendentibus basim versus 2–3 mm. latis, alternis angus-

tioribus (?); petalis oblongis ca. 1 cm. longis ca. 4 mm. latis paullo asymmetricis apice rotundis; staminibus 8 inaequalibus; antheris ovatis ca. 2 mm. longis; filamentis 1 et 3 mm. longis glabris; stylo 7–8 mm. longo glaberrimo apicem subintegro; bacca capsulari angulata ca. 15 mm. longa ca. 4 mm. crassa.—COLOMBIA: Ultra Abate, *Holton 892* (TYPE, N. Y. Bot. Gard.); Barroblanco, *André 1336* (NY).—A species remarkable because of its very abbreviated broad hypanthium and angular capsular fruit. Both specimens appear to have been obtained to the east of Bogotá. The clean brownish cast of the dried foliage is unique, as is also the very long and angulate ovary. At first glance the latter is readily mistaken for the hypanthium, that being very short and broader than long.

Fuchsia Andrei, sp. nov., fruticans glabrata; ramulis fistulosis apicem versus minute pubescentibus mox glaberrimis nitidis laevigatis 4–8 mm. crassis; foliis oppositis vel ternatis oblongis vel obovato-oblongis 7–16 cm. longis 3–6.5(–9) cm. latis margine integerrimis minute sparseque ciliolatis apice abrupte acuminatis basi obtusis vel acutis supra viridibus glaberrimis subtus pallidioribus in nervis prominentibus sparse inconspicue villosulis; petiolis 1–2.5 cm. longis glabratis; stipulis caducis obliquis deltoideis ca. 1 mm. altis; inflorescentia breviter racemosa parvibracteata; bracteis lanceolatis 3–9 mm. longis quam pedicelli graciles 10–15 mm. longi multo brevioribus; ovario oblongo glabrato ca. 5 mm. longo ca. 2–2.5 mm. crasso; hypanthio 2–3 cm. longo basi subnodoso supra medium apicem versus gradatim ampliato 4–4.5 mm. crasso extus glaberrimo intus infra medium piloso; sepalis oblongo-lanceolatis acutis 6–9 mm. longis ascendentibus; petalis lineari-oblongis ca. 10 mm. longis ca. 3 mm. latis obtusis quam sepala vix longioribus; staminibus 8 inaequalibus glabris gracilibus; stylo infra medium piloso cum stigmate 4-lobato coronato; bacca 5–6 mm. longa.—COLOMBIA: Rio de Huannamaca, 1876, *André K. 820* (TYPE, Field Mus. no. 537,131; ISOTYPE, NY); Tambo de Savanilla, 1877, *André K. 818* (G, NY, FM).—In a very general way suggesting *F. scabriuscula* Benth., an Ecuadorian species, but quite different in its terminally racemose flowers and glabrous foliage. Under a lens the surface of the leaves appears to be minutely and closely pebbled.

Fuchsia atrorubra, sp. nov., fruticans; ramulis subteretibus strigulosis; foliis herbaceis ternatis obovatis vel obovato-ellipticis 4–12 cm. longis 2.5–5 cm. latis inconspicue denticulatis apice acutis basim versus in petiolum 6–20 mm. longum attenuatis supra glabratis puberulentisve subtus pallidioribus in venis dense strigosis; stipulis

deltoideis glabris crassis subpersistentibus ca. 1–1.5 mm. altis; floribus in axilla terminali vel subterminali orientibus in racemos foliosos 1–3 cm. longos cernuos aggregatis; pedicellis 5–8 mm. longis densissime canescente strigosis; ovario ellipsoideo 4–5 mm. longo; hypanthio 13–15 mm. longo gracili basi vix nodoso apicem versus gradatim minime dilatato 2–2.5 mm. crasso in sicco purpureo-rubro extus dense striguloso intus dense villosulo; sepalis lineari-lanceolatis 6–8 mm. longis 1–1.5 mm. latis; petalis lanceolato-oblongis acutis 6–7 mm. longis 1.5–2 mm. latis in sicco roseo-purpureis; staminibus 8 inaequalibus inclusis; antheris oblongis; stylo pubescenti; bacca elliptica 13–14 mm. longa 5–6 mm. crassa.—COLOMBIA: along stream, "Santa Elena" above Santuario, Dept. Caldas, 2000–2300 m. alt., *Pennell 10313* (TYPE, Gray Herb.); wet forested cliff, Rio Santa Rita, Salento, Dept. Caldas, 1600–1800 m. alt., *Killip & Hazen 8966* (G); roadside thickets, Salento, Dept. Caldas, 1700–1900 m. alt., *Pennell & Hazen 10144* (G).—A species characterized by its very small, dark, terminal, more or less racemose flowers. *Fuchsia Hartwegi* Benth., *F. sessiliflora* Benth., and *F. verrucosa* Benth. are the only small-flowered members of the genus described from northwest South America. The two former have bright-colored flowers in racemose panicles, and the last has very short petioles and a restricted rough pubescence.

Fuchsia glaberrima, sp. nov., macrophylla frutescens; foliis firmis late oblanceolatis 10–20 cm. longis 4–8 cm. latis integerrimis oppositis acutis basim versus attenuatis saepe purpureo-tinctis subsessilibus vel brevissime (2–5 mm. longe) petiolatis; stipulis persistentibus firmis connatis reflexis, jugis connatis latissime triangularibus 2–2.5 mm. altis 4–5 mm. latis; floribus in racemum parvifoliate bracteatum terminalem aggregatis coccineis ca. 7 mm. longe pedicellatis; ovario fusiformi 8–9 mm. longo 1.5–2 mm. crasso; hypanthio 2.5–3 cm. longo basi nodoso deinde subcontracto apicem versus gradatim ampliato 5–6 mm. crasso extus glaberrimo intus dense pubescenti; sepalis oblongis 9–11 mm. longis ca. 4.5 mm. latis; petalis ca. 9 mm. longis late obovatis quam sepala brevioribus apice rotundatis; staminibus inaequalibus 8 inclusis; filamentis pro genere brevibus; antheris oblongis; stylo dense pubescenti cum stigmate leviter lobato coronato.—ECUADOR: Valley of Pastaza River, between Baños and Cashurco, 8 hours east of Baños, Prov. of Tungurahua, 1300–1800 m. alt., *Hitchcock 21750* (TYPE, Gray Herb.).—Evidently an ally of *F. spectabilis* Hook., agreeing with it in being practically glabrous, and especially in its peculiar stipules. The stipules of the opposite leaves

are confluent to form a single coarse broad persistent reflexed stipular appendage on each side of the stem. *Fuchsia glaberrima* differs from *F. spectabilis* in its smaller flowers borne in a terminal cluster rather than solitary in the axils of the main leaves, in its densely pubescent rather than very sparsely villous inner surface of the hypanthium, and in its entire (not ciliate-margined) leaves.

Fuchsia Hitchcockii, sp. nov., fruticans foliosa pubescens; foliis ternatis firmis ellipticis vel elliptico-obovatis 3–6 cm. longis 1.5–2.2 cm. latis remote denticulatis 5–15 mm. longe petiolatis apice acutis basim versus (rare inaequaliter) attenuatis supra sparsissime puberulentis in sicco atris subtus pallidioribus sparse canescenter villosis; stipulis subulatis deciduis ca. 2 mm. longis inconspicuis; floribus coccineis axillaribus 2–5 cm. longe pedicellatis; ovario obovato-elliptico 3–4 mm. longo breviter villoso; hypanthio 5–6 cm. longo basi nodoso deinde paullo constricto apicem versus gradatim ampliato 5–6 mm. crasso extus sparsissime villoso intus velutino-pubescenti; sepalis lanceolatis longe acuminatis 18–22 mm. longis 4–5 mm. latis; petalis orbiculari-obovatis 10–12 mm. longis apice rotundatis; staminibus 8 inaequalibus quam petala brevioribus longioribusve; antheris oblongis; stylo pubescenti stigmate globoso subintegro exserto coronato.—ECUADOR: between Oña and Cuenca, Prov. of Azuay, 2700–3300 m. alt., *Hitchcock 21603* (TYPE, Gray Herb.).—An interesting species with medium-sized pubescent ternate leaves and very slender elongate axillary flowers. The narrow sepals nearly twice exceed the broadly obovate rounded petals. It is apparently most related to *F. ayavacensis* HBK., but differs in its more elongate hypanthium, narrow and longer sepals, pubescent style, and more coarsely pubescent stems and leaves.

Fuchsia Townsendii, sp. nov., fruticosa foliosa canescens; foliis ternatis oblanceolatis 6–12 cm. longis 22–30 mm. latis firmis margine remote denticulatis paullo revolutis apicem versus in acumen curvatum attenuatis basim versus in petiolum 5–20 mm. longum pubescentem gradatim contractis supra viridibus inconspicue sparseque villosulis subtus pallidioribus cum nervis prominentibus infra medium dense breviter canescenti-villosis; stipulis subulatis caducis 1–2 mm. longis; floribus axillaribus paucis coccineis; pedicellis gracilibus ascendentibus pubescentibus 15–25 mm. longis; ovario anguste ellipsoideo ca. 9 mm. longo breviter villoso; hypanthio 5–5.5 cm. longo basi nodoso deinde contracto deinde graciliter tubuloso apicem versus gradatim ampliato 5–6 mm. crasso extus puberulento intus infra medium dense canescenti-pubescenti; sepalis 10–12 mm. longis

ascendentibus lanceolatis acutis basi ca. 4 mm. latis; petalis ovatis 9–10 mm. longis ca. 8 mm. latis apice rotundis vel obtusis quam sepala paullo brevioribus; staminibus 8 inaequalibus glabris pubescentibus; stylo infra medium pubescenti cum stigmate globoso subintegro ornato.—ECUADOR: Sabiango Hill, Nov. 26, 1910, *C. H. T. Townsend A93* (TYPE, U. S. Nat. Herb. no. 534,349).—Related to *F. Hitchcockii*, from which it differs in its larger more attenuate leaves, shorter softer as well as denser pubescence, and shorter sepals.

Fuchsia apiculata, sp. nov., frutex; ramulis molliter pubescentibus; foliis firmis oblongis vel elliptico-oblongis 2.5–6 cm. longis 12–20 mm. latis remote denticulatis acutis saepe ternatis 1–3 cm. longe petiolatis subtus pallidioribus infra medium costam versus evidenter canescenti-villosis; stipulis subulatis inconspicuis deciduis 1–2 mm. longis; floribus axillaribus saepe 1–2 cm. longe pedicellatis coccineis pendulis; ovario pubescenti elliptico 3–4 mm. longo; hypanthio 20–25 mm. longo basi fusco et nodoso deinde subconstricto apicem versus gradatim ampliato 5–6 mm. crasso extus glabrato intus infra medium dense canescenti-pubescenti; sepalis ovato-oblongis 8–9 mm. longis acutis evidenter apiculatis; petalis ovatis ca. 6–7 mm. longis ca. 5 mm. latis late breviterque unguiculatis apice obtusis; staminibus 8 inaequalibus glaberrimis inclusis; antheris breviter oblongis; stylo infra medium canescente pubescenti aliter glabro stigmate globoso subintegro coronato.—ECUADOR: Between Cuenca and Huigra, Prov. of Azuay, and Cañar, 2700–3000 m. alt., *Hitchcock 21667* (TYPE, Gray Herb.).—In general habit somewhat suggesting *F. decussata* R. & P. of Peru, but differing in color of pubescence, obovate petals, and densely pubescent inner surface of the hypanthium.

Fuchsia spectabilis Hook., var. **pubens**, var. nov., in foliis et hypanthiis dense molliter pubescens.—ECUADOR: vicinity of Huigra, *Rose & Rose 22479* (TYPE, U. S. Nat. Herb. no. 1,022,130).—Differing from the typical form in its minute soft pubescence—an indument so soft and fine that the foliage feels waxy to the touch. I am unable to detect any difference between the description of *F. longiflora* Benth., Pl. Hartweg. 177 (1845), and plants referable to *F. spectabilis* Hook., Bot. Mag. lxxiv. t. 4375 (1848), but am using the latter name since I know positively that it applies to the concept in mind and because it seems unlikely that Hooker, who had Bentham's types available, would have proposed his species had it been quite like the earlier.

Fuchsia hypoleuca, sp. nov., fruticans foliosa pubescens; foliis firmis ternatis late lanceolatis 3–7.5 cm. longis 1–1.7 cm. latis apicem

et basim versus acutis margine saepe paullo revolutis remote denticulatis supra viridibus inconspicue sparseque hispidulis subtus pallidis hispidis cum nervis prominentibus; petiolis 5–10 mm. longis dense pubescentibus; stipulis setaceis caducis erectis 2–3 mm. longis; floribus axillaribus pendulis coccineis vix numerosis; ovario elliptico ca. 4 mm. longo strigoso; hypanthio 18–23 mm. longo basi bulboso deinde contracto apicem versus gradatim ampliato 4(–6) mm. crasso extus puberulento intus infra medium dense villoso; sepalis lanceolatis 8–12 mm. longis ascendentibus basi ca. 2.5 mm. latis; petalis obovatis ca. 7 mm. longis 4–5 mm. latis quam sepala 2–4 mm. brevioribus apice rotundis; staminibus 8 inclusis inaequalibus glabris; stylo basim versus villoso cum stigmate subintegro coronato.—ECUADOR: between Loja and San Lucas, Prov. Loja, 2100–2600 m. alt., *Hitchcock 21440* (TYPE, Gray Herb.): "southern provinces," *W. Jameson* (US).—Most related to *F. scabriuscula* Benth., from which it differs in its narrow ternate leaves and canescent rather than brownish pubescence. Both of the cited specimens usually have the paleness of the under leaf-surfaces intensified by a fine dense covering of fungus mycelium.

Fuchsia macrophylla, sp. nov., fruticosa laxe ramosa 15 dm. alta; caulibus fistulosis 4–6 mm. crassis griseis partibus junioribus puberulentis ceteris glabratis; foliis herbaceis oppositis puberulentis ellipticis vel lato-oblanceolatis in petiolum 2–4 cm. longum gradatim contractis 10–27 (saepe ca. 16) cm. longis 2.5–7 (saepe ca. 5.5) cm. latis apice grosse acuminatis margine integerrimis paullo undulatis; stipulis filiformibus deciduis ca. 2 mm. longis; floribus coccineis; corymbulis laxis paucifloris foliaceo-bracteatis ex axillis superioribus orientibus; pedicellis gracilibus erectis divaricatisve 1–2 cm. longis; ovario ellipsoideo puberulento ca. 5 mm. longo; hypanthio ca. 23 mm. longo basi nodoso deinde contracto apicem versus gradatim ampliato 4–5 mm. crasso extus puberulento mucronato (mucro viridescenti); petalis oblanceolato-obovatis ca. 9–10 mm. longis apice rotundatis mucronatis sepala paullo superantibus; staminibus 8 inaequalibus quam petala paullo brevioribus; antheris oblongis; stylo villoso stigmate subintegro coronato.—PERU: along streams, Hacienda Schunke, La Merced, Dept. Junin, 1200 m. alt., *Macbride 5616* (TYPE, Field Mus. no. 536,655; ISOTYPE, Gray Herb.).—Well marked by its small flowers and large thin leaves tapering at both ends. To judge from descriptions it seems related to *F. asperifolia* Krause, but differs in being puberulent rather than hirsute, and in having a different inflorescence. Although the flowers of *F. macrophylla* appear to be borne in small leafy pedunculate corymbs produced along the upper parts of the

branches, they are in fact solitary in the axils on leafy branchlets only 2–3 cm. long.

Fuchsia velutina, sp. nov., scandens canescente velutina; foliis oppositis ellipticis firmis 6–11 cm. longis 3–5 cm. latis integerrimis vel inconspicue denticulatis dense minute canescente velutinis apice breviter acuminatis basim versus paullo attenuatis superioribus vix reductis in venis et costa purpureo-tinctis; petiolis 6–15 mm. longis; floribus terminalibus in racemum brevibracteatum brevipedunculatum pauciflorum dispositis; pedicellis 6–10 mm. longis; ovario ellipsoideo ca. 5 mm. longo inconspicue velutino; hypanthio 5–6 cm. longo basi bulboso deinde sensim contracto, 2–3 cm. supra basim gradatim ampliato deinde cylindrico vel ca. 2 cm. supra basim ad summum gradatim ampliato ca. 5 mm. crasso extus puberulento intus sparse pubescenti; sepalis lineari-lanceolatis 13–15 mm. longis acutis; petalis linearibus 14–17 mm. longis ca. 3 mm. latis acutis; staminibus 8 inaequalibus inclusis glabris; stylo pubescenti stigmate globoso subintegro coronato; bacca ignota.—PERU: Yanano, ca. 1800 m. alt. *Macbride 3715* (TYPE, Field Mus. no. 534,777; ISOTYPE, Gray Herb.).—A species well-marked by its firm canescent-velvety leaves and few-flowered terminal racemes of elongate slender flowers. In habit *F. velutina* suggests *F. miniata* Planch. & Lind., a Colombian species, but differs in its pubescence and consistently opposite leaves.

Fuchsia polyanthella, sp. nov., scandens; ramis ca. 4 mm. crassis partibus junioribus sparse hispidulosis; foliis oppositis 10–15 cm. longis 5–7 cm. latis firmiter membranaceis ellipticis hispidulostrigosis apice breviter acuminatis basin versus in petiolum hispidulum 2–5 cm. longum attenuatis subtus pallidioribus margine integris vel inconspicue denticulatis ciliolatis; stipulis cuneato-lanceolatis glabris 2–4 mm. longis tarde deciduis; floribus coccineis graciliter (ca. 12–15 mm. longe) pedicellatis in racemum ca. 1 cm. longe lanceolatobracteatum axillarem 1–5 cm. longum 2–5 cm. longe pedunculatum aggregatis; racemis omnibus in paniculam laxam terminalem decidue foliolosam 1–4 dm. longam dispositis; ovario ellipsoideo glaberrimo 5–6 mm. longo; hypanthio ca. 15 mm. longo basi nodoso deinde subconstricto apicem versus paullo ampliato 3–4 mm. crasso extus glaberrimo intus infra medium villoso; sepalis lanceolatis acutis ascendentibus 10–12 cm. longis; petalis obovato-oblongis ca. 8 mm. longis obtusis quam sepala paullo brevioribus; staminibus 8 inaequalibus quam petala brevioribus; antheris oblongis; stylo glabro stigmate globoso leviter quadrifido coronato; bacca ca. 1 cm. longa.—PERU: Muña, on trail to Tambo de Vaca, Dept. Huanuco, 2400 m. alt., *Macbride 4290*

(TYPE, Field Mus. no. 535,372; ISOTYPE, Gray Herb.).—Characterized by its rather large bicolored strigose leaves and open terminal panicles formed of pedunculate short small-bracted racemes developing from the upper leaf-axils. Although coming from Muña, the source of most of the Fuchsias described by Ruiz & Pavon, it is quite different from any of those species. Among the species known from Muña *F. polyanthella* most suggests *F. oratis* R. & P., but is quite different in its much smaller externally glabrous flowers, quite different inflorescence, and more slender glabrate stems.

Fuchsia abrupta, sp. nov., frutex scandens; ramis divaricatis glabris ca. 5 mm. crassis; foliis subcoriaceis oppositis lanceolatis vel oblanceolatis 8–12 cm. longis 2.5–4 cm. latis integerrimis 4–8 mm. longe petiolatis apice acuminatis basi angustis supra glabris (in sicco) fuscis subtus pallidis conspicue paralleliterque nervatis villoso-puberulentis, eis inflorescentiarum abrupte multo reductis; stipulis filiformi-subulatis deciduis ca. 3 mm. longis; floribus terminalibus in racemum 1–2 dm. longum bracteatum pendulum dispositis coccineis 2.5–4 cm. longe pedicellatis; ovario elliptico ca. 7 mm. longo glabro; hypanthio 3.5–4.5 cm. longo basi nodoso deinde contracto apicem versus cylindrico vel saepe paullo gradatim ampliato 4–5 mm. crasso extus glabro intus basim versus villoso; sepalis lanceolatis 13–15 mm. longis acutis; petalis oblongis apice obtusis mucronatis sepalis subaequalibus ca. 14–15 mm. longis; staminibus 8 inaequalibus quam petala brevioribus; antheris oblongis; stylo basim versus villoso stigmate globoso leviter quadrifido coronato; bacca cylindrica 13 mm. longa ca. 4 mm. crassa. —PERU: along river, Cushi, Dept. Huanuco, 1500 m. alt., *Macbride 4541* (TYPE, Field Mus. no. 535,618; ISOTYPE, Gray Herb.).—Well marked by its elongate bicolored leaves that are suddenly reduced in the terminal racemose inflorescence.

FUCHSIA BOLIVIANA Carr. Rev. Hort. xlviii. 150 cum tab. (1876).—BOLIVIA: vicinity of Sorata, *Mandon 622* (G); near Yungas, 1200 m. alt., *Rusby 1071* (G, US); Yungas, *Bang 327* (G, US); without locality, *Bang 1806* (G, US), *Bang 2833* (G, US), *Holway 643* (US). PERU: Ollantaytambo, 3000 m. alt., *Cook & Gilbert 290* and *443* (US); San Miguel, Urubamba Valley, 1800 m. alt., *Cook & Gilbert 915* (US); Tambo, Dept. of Ayacucho, 3100–3200 m. alt., *Weberbauer 5555* (FM).—The above named species which was clearly described and beautifully illustrated by Carrière is the one from Bolivia and southern Peru which has usually passed for *F. corymbiflora* R. & P. A study of Ruiz & Pavon's description and plate, Fl. Peruv. iii. 87, t. 325 (1802), makes it clear that *F. boliviana* and *F. corymbiflora* are quite

distinct, the latter having a much broader more inflated hypanthium that is densely pubescent outside and glabrous within, obtuse buds, and a comparatively small inflorescence rather than a large drooping one. The corollas of *F. boliviana* are merely puberulent outside, but within are densely pubescent below the middle, and the hypanthium is only very gradually dilated, being very slender and almost tubular. The buds are apiculate. The stems of the plant are usually abruptly terminated, above a certain point producing only several strongly drooping or pendent corymbose racemes and only a few reduced leaves. In northwestern South America *F. boliviana* is represented by the following variety.

Fuchsia boliviana, var. **luxurians**, var. nov., splendens; hypanthio 5–6 (non 3–4) cm. longo.—JAMAICA: vicinity of St. Helens Gap, St. Andrew, 1475 m. alt., *Maxon & Killip 571* (G). VENEZUELA: Colonia Tovar, *Pittier 9252* (TYPE, Gray Herb.), *Jahn 439* (US). COLOMBIA: "Las Minitas," south of Caldas, *Pennell 10970* (G).—This variety is the plant most common under the name of *F. corymbiflora* R. & P., and that well illustrated in the Botanical Register, xxvi. t. 70 (1840), and the Botanical Magazine, lxix. t. 4000 (1843). It differs from typical *F. boliviana* in its larger (albeit similarly proportioned) flowers and better developed longer racemes. It appears to be only a more luxuriant northern variant of this species.

Fuchsia Steinbachii, sp. nov., fruticans apetala; ramis 2–3 cm. crassis glabris brunnescentibus cortice plus minusve deciduo; foliis herbaceis oppositis ovato-oblongis 4–8 cm. longis 1.5–3.5 cm. latis sparse puberulentis supra (in sicco) fuscis subtus pallidioribus et evidenter nervatis margine integris vel inconspicue denticulatis apice acutis vel acuminatis basim versus in petiolum 8–12 mm. longum contractis; stipulis deciduis inconspicuis subulatis ca. 1 mm. longis; floribus in racemum parvifoliate bracteatum terminalem aggregatis carneis 1.5–3(–4) cm. longe pedicellatis; ovario fusiformi 6–8 mm. longo 2–2.5 mm. crasso glabro; hypanthio 4–5 cm. longo basi nodoso deinde subcontracto apicem versus gradatim ampliato 5–6 mm. diametro extus glaberrimo intus omnino vel saltem infra medium conspicue pubescentibus; sepalis anguste lanceolatis ca. 2 mm. longis ca. 4 mm. latis ascendentibus acuminatis; petalis nullis; staminibus 8 inaequalibus glaberrimis inclusis vel extrusis; antheris oblongis; stylo infra medium canescente pubescenti; stigmate oblongo-globoso; bacca ca. 9 mm. crassa.—BOLIVIA: open woods, Incachaca, Dept. of Cochabamba, 2500 m. alt., *Steinbach 5038* (TYPE, N. Y. Bot. Gard.); without locality, *Kuntze* (NY).—This species belongs to the group of

F. membranacea Hemsl., Jour. Bot. xiv. 70 (1876), and is apparently most related to *F. juntasensis* Kuntze from which it differs in its larger, longer-petiolate leaves, much larger calyx-lobes and strongly unequal stamens.

Fuchsia furfuracea, sp. nov., fruticans; ramulis sparse villoso-hirsutis; foliis oppositis firmis oblongis 7–9 cm. longis 2.5–4 cm. latis evidenter denticulatis dense minute furfuraceis opacis apicem versus in acumen grossum curvatum attenuatis basi saepe obtusis 8–20 mm. longe petiolatis, supra breviter hirsuto-strigosis, subtus strigosis pallidioribus juventate dense villoso-tomentosis; stipulis lanceolatis 2–3 mm. longis acuminatis herbaceis deciduis; floribus coccineis in racemum terminalem parvibracteatum erectum congestis; pedicellis 2–4 cm. longis conspicue pubescentibus; ovario elliptico ca. 8 mm. longo dense villoso; hypanthio 3.5–4.5 cm. longo basi nodoso deinde constricto medium versus ampliato deinde cylindrico et ca. 7 mm. crasso extus plus minusve hispido-villoso intus villoso; sepalis lanceolatis attenuatis 15–20 mm. longis in alabastro apicibus liberis ca. 2 mm. longis; petalis ovatis ca. 9 mm. longis apice obtusis; staminibus 8 inaequalibus glabris; antheris oblongis; stylo retrorso-villoso stigmate leviter lobato coronato.—Bolivia: Unduavi, 3000 m. alt., *Rusby 2511* (NY); Yungas, *Bang 674* (type, Gray Herb., isotype, US, NY).—A well defined species with opaque minutely furfuraceous-pubescent leaves, and large terminal racemose flowers. From *F. peruviana* Carr., the only other petaliferous Bolivian species with definitely terminal inflorescence, it differs in the shape of the buds, their free tips, and the longer-petioled furfuraceous leaves. The plant much suggests the original plate of *F. corymbiflora* R. & P., Fl. Peruv. iii. t. 325 (1802), but differs in its longer pedicels, pubescent inner surface of the hypanthium, and less pubescent more acuminate leaves.

Fuchsia Brittonii, nom. nov. *F. boliviana* Britt. Bull. Torr. Bot. Cl. xvii. 214 (1890); not *F. boliviana* Carr. (1876).—Bolivia: vicinity of Ananca, 2900 m. alt., *Mandon 624* (G); Yungas, *Bang 675* (G); Peru: San Miguel, Urubamba Valley, 1800 m. alt., *Cook & Gilbert 1110* (G).

Gilia inyoensis, sp. nov., herba annua humilis a basi laxe ramosa 5–10 cm. alta; caulibus gracilibus dichotomis rubescentibus basim versus villosis aliter glabratis sparse sed evidenter stipitato-glandulosis; foliis basalibus evanescentibus laxe rosulatis 8–12 mm. longis ca. 2.5 mm. latis sparse villosis crassis late affixis oblanceolatis acutis et mucronatis; foliis caulinis sparsis alternis recurvatis saepe villosis oblongis vel oblongo-lanceolatis rariter pauci-lobatis 3–8 mm. longis

1–2 mm. latis; floribus axillaribus sparsis superioribus in corymbum pauciflorum aggregatis; pedicellis gracilibus saepe ascendentibus 8–16 mm. longis sparse stipitato-glandulosis; sepalis lanceolatis acutis 2–3 mm. longis evidenter scarioso- et albo-marginatis sparse glandulosis; corolla 5–6 mm. longa 6–10 mm. diametro glabra, tubo brevi 2–2.5 mm. longo paullo ampliato ca. 2 mm. diametro aurantiaco-brunnescentibus, lobis ascendentibus albis (in sicco dilute aurantiaco-tinctis) obovatis obtusis vel plus minusve retusis rariter paullo inconspicueque cuspidatis; filamentis glabris 2 mm. longis albis infra medium tubum affixis; ovario elliptico brunneo; capsula ignota.—CALIFORNIA: in coarse granite sand in the foothills west of Bishop, Inyo County. *Heller 8281* (TYPE, Gray Herb.).—Although it has been confused with *G. campanulata* Gray, which in fact is its immediate relative, *G. inyoensis* is readily separable by its reddish stems, small subentire leaves and very differently proportioned corolla. The proposed species has a broadly funnelformed corolla with a tube shorter than the corolla-lobes and sepals, and not one which is clearly campanulate nor has a well developed tube longer than either corolla-lobes or sepals.

V. STUDIES IN THE BORAGINACEAE.—V.

By Ivan M. Johnston.

1. Concerning the Range and Identity of Certain American Species.

Lithospermum cinerascens (A. DC.), comb. nov. *Macromeria cinerascens* A. DC. Prodr. x. 69 (1846); Johnston, Contr. Gray Herb. n. s. lxx. 15 (1924).—A collection made by Macbride & Featherstone (no. 1185) at Yanahuauca, Peru, agrees closely with De Candolle's description of *M. cinerascens* and with a photograph of the type kindly supplied me by Dr. H. M. Hall. The plant is clearly a species of *Lithospermum*, probably most related to *L. mediale* Johnston, and in my recent synopsis of the genus, l. c., keys out with the Mexican *L. calycosum* (Macbr.) Johnston.

LITHOSPERMUM DISTICHUM Ortega, Hort. Matr. Dec. i. 8 (1797); Johnston, Contr. Gray Herb. n. s. lxx. 24 (1924). *Myosotis grandiflora* HBK. Nov. Gen. et Sp. iii. 90, t. 199 (1818); A. DC. Prodr. x. 114 (1846); Johnston, l. c. 55.—It seems clear that the troublesome name, *Myosotis grandiflora* HBK., belongs in the synonymy of *L. distichum*. The type of *M. grandiflora* was examined by Gray in 1887, the year

before his death. I find among his notes, made on the Bonpland herbarium at Paris, that the original material of *M. grandiflora* came from Real del Monte, Mexico, rather than from Eucador as published, and that Gray thought it represented a white-flowered member of *Lithospermum* § *Batschia*. With these clews as to the real source of the type specimens and the probable relationship of the plant, it is readily seen from an examination of Kunth's description and plate that *M. grandiflora* is a rather large-flowered phase of *L. distichum*, the common white-flowered species of southern Mexico.

LITHOSPERMUM LASIOSIPHON Johnston, Contr. Gray Herb. n. s. lxx. 22 (1924).—This species, described from the Sierra Madre of middle Chihuahua, can now be reported from the "State of Durango" there being a specimen from that region in the National Herbarium collected by P. Ibana Garcia (no. 394). The Durango material differs from the type in its lack of persistent basal leaves and in having the lower leaf-surfaces not noticeably glaucescent.

LITHOSPERMUM MULTIFLORUM Torr. in Gray, Proc. Am. Acad. x. 51 (1874).—This species has a clear synonym in *L. arizonicum* Gandoger, Bull. Soc. Bot. France lxv. 62 (1918), a species based upon *MacDougal 242* from Flagstaff, Arizona. The corolla of this as well as numerous other American lithosperms has been described and figured in an excellent paper by Spengler, Oesterr. Bot. Zeitschr. lxviii. 109 (1919). This useful paper was overlooked by me during the preparation of my synopsis of *Lithospermum* as were also Bessey's paper, Am. Nat. xiv. 417–421 (1880), on "The supposed dimorphism in Lithospermum longiflorum," and Smith's, Bot. Gaz. iv. 168 (1879), on "Trimorphism in Lithospermum canescens."

LASIARRHENUM STRIGOSUM (HBK.) Johnston, Contr. Gray Herb. n. s. lxx. 15 (1924). *Onosmodium eriocaulon* A. DC. Prodr. x. 70 (1846); Johnston, l. c. 55.—Through the kindness of Dr. H. M. Hall I have seen a photograph of the type of *Onosmodium eriocaulon*. A study of this photograph has convinced me that De Candolle's species is the same as *Lasiarrhenum strigosum*. The type is in fruit only, but has the coarse shaggy stem-pubescence and narrow leaves characteristic of *L. strigosum*. It was collected by Berlandier in the Cordillera de Guchilaque. This locality has not been precisely located but from data given by Lasègue, Notices Mus. Bot. Delessert 207 (1845), it appears to be in western Morelos or in the southern part of the state of Mexico and hence just within the known range of *L. strigosum*.

ANTIPHYTUM FLORIBUNDUM (Torr.) Gray, Proc. Am. Acad. x. 55

(1874). *Amsinckia mexicana* Mart. & Gal. Bull. Acad. Brux. xi. 339 (1844); not *Antiphytum mexicanum* DC. (1846).—Through the courtesy of Professor E. De Wildeman I have had the opportunity of studying fragments of *Galeotti 7207* from the representation of that number in the herbarium of the Jardin botanique de l'Etat at Brussels. The material is labeled *Amsinckia mexicana* Mart. & Gal. and agrees with the original description of that species, but though bearing the same number as the single collection cited by Martens & Galeotti it has different locality-data. The material is given as coming from "Mexico. prov. de. Mextitlan Sangre de Grado," not from "dans les forêts de chênes du Cerro de Quinzéo, près Morelia de Michoacan" as published. Despite this discrepancy in data, and because of the perfect agreement between material and description, I am perfectly content to refer *Amsinckia mexicana* Mart. & Gal. to *Antiphytum floribundum* DC. The latter does occur in Michoacan, Pringle, under his number 3604, having distributed specimens from the "hills of Patzcuaro."

ERITRICHIUM MESEMBRYANTHEMOIDES Speg. Anal. Soc. Cientif. Argent. liii. 136 (1902). *Plagiobothrys mesembryanthemoides* Johnston, Contr. Gray Herb. n. s. lxviii. 79 (1923).—ARGENTINA: in arid subsaline places between San Julian and Rio Deseado, Santa Cruz, 1899, *C. Ameghino* (G, part of TYPE).—This peculiar plant is not an *Eritrichium* nor is it a *Plagiobothrys*. A study of authentic, though sterile, material kindly furnished me by Dr. Spegazzini shows it to be a plant quite different from any borage known to me. The pubescence of the plant is very soft and fine, not at all suggesting that of a borage. The general habit of the plant, as Dr. Spegazzini suggested when he described it, is that of one of the *Portulaceae* and it may be that it in fact represents an anomalous species of *Calandrinia* or some similar genus.

MYOSOTIS VIRGINICA (L.) BSP. Prel. Cat. N. Y. 37 (1888); Johnston Contr. Gray Herb. n. s. lxx. 43 (1924). *Eritrichium pampeanum* Speg. Contr. Fl. Sierra Vent. 44 (1896); Johnston, l. c. 53.—ARGENTINA: common along streams in the Sierra Ventana, Buenos Aires, Sept. 14, 1895, *Spegazzini* (G, "COTYPUS" of *E. pampeanum*); hills near Nafofo-cahuellu, Chubut, March 12, 1925, *Spegazzini* (G).—Included in a highly interesting and generous packet of Argentine *Boraginaceae* recently presented to the Gray Herbarium by Dr. Carlos Spegazzini of La Platte, there was authentic material of *Eritrichium pampeanum*. This material, to my astonishment, I find to represent the widely distributed and indigenous North American

species, *Myosotis virginica*, a plant heretofore unrecorded from south of the United States. A detailed microscopic study of the plants from Argentine and the United States has revealed no differences which would justify treating the southern plant as even varietally different. It seems clear that *Myosotis virginica* must be added to that ever increasing list of borage-species which occur both in North America and in the far removed though ecologically similar regions of southern South America.

LAPPULA TEXANA (Scheele) Britt. Mem. Torr. Bot. Cl. v. 273 (1894); Johnston, Contr. Gray Herb. n. s. lxx. 49 (1924).—ARGENTINA: vicinity of General Roco, Rio Negro, *Fischer 124* (G); dry places near Puerto San Julian, Santa Cruz, 1883, *Spegazzini* (G, in part).—A form of this species, apparently the var. *columbiana* (Nels.) Johnston, l. c. 50, is to be accredited a place in the flora of Argentina. In the past this form has been undistinguished from the closely related and habitally similar *L. Redowskii* which also grows in the Argentine Republic.

PECTOCARYA PUSILLA (A. DC.) Gray, Proc. Am. Acad. xii. 81 (1876). *P. chilensis*, var. *californica* Torr. Pacif. R. R. Rep. iv. 124 (1857).—A recent study of the type of Torrey's *P. chilensis*, var. *californica* has shown conclusively that it has been consistently misunderstood. It is not a synonym of *P. linearis*, as has been supposed, but unmistakably a synonym of *P. pusilla*. The type of Torrey's variety is given as having come from the vicinity of Los Angeles, California, which is somewhat surprising since continued work by numerous collectors has not shown *P. pusilla* from that vicinity nor, for that matter, from any other part of Southern California.

COLDENIA NUTTALLII Hook. Kew Jour. Bot. iii. 296 (1851); Gray, Synop. Fl. N. Am. ii. pt. 1, 182 (1878); Johnston, Proc. Calif. Acad. Sci. ser. 4, xii. 1140 (1925). *Tiquiliopsis Nuttallii* Heller, Muhl. ii. 239 (1906). *Tiquilia parrifolia* Nutt. acc. to Hook. l. c. *Tiquilia brevifolia* Nutt. ex Torr. Bot. Mex. Bound. 136 (1859); Torr. Bot. Wilkes Exped. 410, t. 12 (1874). *Tiquilia oregana* Torr. Bot. Wilkes Exped. sub t. 12 (1862). *C. decumbens* Hauman, Apuntes Hist. Nat., Buenos Aires, i. 55 (1909); Anal. Soc. Cient. Argent. lxxxvi. 301 (1918); Johnston, Contr. Gray Herb. n. s. lxx. 59 (1924). (?) *C. nevadensis* Gandoger, Bull. Soc. Bot. France lxv. 61 (1918).—*Coldenia Nuttallii* has been known to range from western Wyoming and eastern Washington to southern Utah and the Mohave Desert of Southern California. It can now be reported from the Argentine Andes. Through the kindness of Professor Lucien C. Hauman of

Buenos Aires I have been permitted to study authentic specimens of the plant from the high Andes of Mendoza described by him as *Coldenia decumbens*. The plant proves indistinguishable from *C. Nuttallii* of the Great Basin of western United States, agreeing not only in details and in gross aspect, but in the annual duration and deeply lobed cotyledons which distinguish that plant from other American species. It is very interesting indeed to find a species of *Coldenia* occurring in both North and South America, and particularly so that *C. Nuttallii*, which has a more northerly range than any other member of the genus, occurring at low and middle altitudes of the Great Basin, should be the one that hurdles the thousands of kilometers of territory to reappear in an Andean valley and there set the southern outpost of the genus, at least in America.

2. New or otherwise interesting Asiatic Borages.

Antiotrema Dunnianum (Diels) Handel-Mazzetti, Anzeiger Acad. Wiss. Wien lvii. no. 19, pg. 239 (Oct. 1920). *Cynoglossum ? Dunnianum* Diels, Notes Royal Bot. Gard. Edinb. v. 168 (1912); Brand, Pflanzenr. iv. Fam. 252, 149 (1921).—Yunnan: between Shia Ping and San Ying, 2400 m. alt., *Rock 3199* (G); dry plain, Yangtze Watershed, eastern slope Likiang Snow Range, Pref. Dist. Likiang, *Rock 3628* (G); dry open lands, Lou Je Ssu, Yangtze Watershed, eastern slope of Likiang Snow Range, Pref. Dist. Likiang, *Rock 3701* (G); between Nau Chien and Mi Hai Ti, headwaters of the Red River, 1360–1950 m. alt., *Rock 3090* (G).—This remarkable and only recently described genus was inadvertently omitted from my paper on the Old World genera of the *Boraginoideae*, Contr. Gray Herb. n. s. lxxiii. 42–73 (1924). It has been with considerable interest, therefore, that I have studied Mr. Rock's fine representation of the plant. This study has convinced me that both Handel-Mazzetti, l. c., and Brand, l. c., are incorrect in refering the genus to the *Lithospermeae*. *Antiotrema* appears clearly to be a member of the tribe *Cynoglosseae* and seems most related to that group of Cynoglossums which Brand, l. c. 85, has segregated to form the genus *Lindelofia*. It suggests that group in habit and floral developments, but differs markedly in fruiting structures. In general form, position and attachment, the nutlets of *Antiotrema* suggest those of *Bothriospermum*, being free from the style, vertical, with the apical end downward and attached by a flat or even inwardly sloping gynobase. The nutlets of *Antiotrema* entirely lack the glochidiate appendages characteristic of *Cynoglossum*

and its close relatives, and differ from the simply tuberculate and much smaller nutlets of *Bothriospermum* in being densely and finely muriculate in addition to being more or less irregularly and coarsely papillose-rugose. In *Antiotrema* the nutlets have a dorsal margin suggesting that of *Bothriospermum*. Like the condition in the latter genus, cf. Contr. Gray Herb. lxxiii. 72 (1924), the dorsal areolas of the nutlets face one another and surround the style when *in situ*. The margin is low, rounded, thick, and callous in structure, and as in *Bothriospermum*, incloses the base of a somewhat connivent fragile cartilaginous veil. Although agreeing remarkably in fruit, *Bothriospermum* and *Antiotrema* are probably not immediately related. They are separable by their habit, inflorescence, and floral structure, *Bothriospermum* containing small leafy annuals with simple bracteate racemes and broad very short corollas and included stamens, whereas *Antiotrema* is a thick-rooted coarse perennial with paniculate racemes and cylindrical corollas with protruded stamens. Dissection clearly shows that in *Antiotrema* the radicle end of the embryo is next the attachment-end of the nutlet, and hence, at least in a morphological sense, the nutlet-attachment is apical. Only two other genera in the family have this unusual inverted nutlet-attachment, these are *Bothriospermum* of Asia and the anomalous *Harpagonella* of western North America. It has been generally assumed that the *Labiatae* and *Verbenaceae* were sharply separable from the *Boraginaceae* by having the radicle-end of the embryo inferior rather than superior. In *Antiotrema*, *Bothriospermum* and *Harpagonella* the radicle and the micropyle are inferior, quite as in the *Labiatae* and *Verbenaceae*. Though having the radicle inferior these three genera have epitropous ovules and so agree with the other *Boraginaceae* and differ from the *Labiatae* and *Verbenaceae*, which have apotropous ovules.

Lasiocaryum, nom. nov. *Oreogenia* Johnston, Contr. Gray Herb. n. s. lxxiii. 65 (1924); not *Orogenia* Wats. Bot. King Exped. 120 (1871). —Several persons have called my attention to the fact that the name *Oreogenia*, recently published by me, has a practical if not an exact homonym in Watson's *Orogenia*. Since the two names are etymologically the same in origin and intent and differ only in the presence or absence of a connecting vowel, a trivial difference and after all only a matter of taste, a substitute name is here proposed for the Asiatic borage. The new generic name is suggested by the pubescent nutlets of both the known species.

A recent study of the two species of *Lasiocaryum* has convinced me that the genus has a closer relative in *Chionocharis* than originally

supposed. *Lasiocaryum* and *Chionocharis* are both characterized by densely strigose nutlets, and both come from the same phytogeographic area. The pubescence, umbonate stigma, and broad leaves, of which at least the lowermost are congested, are features common to both genera and suggest a close affinity. Although future collecting may produce forms intermediate between the two genera, at present they seem readily distinguishable as follows,—*Chionocharis:* nutlets attached by a definite triangular suprabasal areola; gynobase low-pyramidal; corolla-tube not appendaged below the filament-attachment; anthers oblong; leaves all imbricate-congested; plant pulvinate. *Lasiocaryum:* nutlets attached nearly their whole length; gynobase elongate, columnar; corolla-tube appendaged mid-way between its base and the anther-attachment; anthers ovate; early basal leaves rosulate; plant erect and branched.

Lasiocaryum Munroi (Clarke), comb. nov. *Eritrichium Munroi* Clarke in Hook. Fl. Brit. Ind. iv. 165 (1883). *Oreogenia Munroi* Johnston, Contr. Gray Herb. n. s. lxxiii. 66 (1924).—Himalayas, from Kumaoan to Sikkum.

L. trichocarpum (Hand.-Maz.), comb. nov. *Microcaryum trichocarpum* Hand.-Maz. Anzeiger Acad. Wiss. Wien lxi, no. 20, p. 164 (1924).—Yunnan and Szechuan.

Trigonotis contortipes, sp. nov., herbacea prostrata annua saepe subsericeo-pubescens; caulibus tenuibus 1–4 dm. longis strigosis infra mediam partem pauciramosis dissitifoliis; foliis caulinis oblongo-obovatis vel oblongis 5–9 mm. longis firmis valde costatis integerrimis adpresse breviterque villosis aliquando ciliatis subtus paullo pallidioribus apice rotundatis mucronatis basi attenuatis; foliis inferioribus in petiolum 6–13 mm. longum attenuatis, superioribus sessilibus; floribus remotis saepe foliolaceo-bracteolatis; pedicellis gracilibus saepe contortis strigosis 2–10 mm. longis; calyce 5-fido canescenti-strigoso, maturitate vix 2 mm. longo, lobis ascendentibus linearibus obtusis; corolla caerulea, limbo patenti 4–5 mm. diametro, tubo cylindrico 1.5 mm. longo, lobis orbicularibus ca. 2 mm. diametro, fornicibus trapeziformibus retusis breviter pubescentibus; staminibus tubo medio affixis, filamentis 4–5 mm. longis, antheris oblongis 6–7 mm. longis; nuculis 1.5–2 mm. altis obscure tetragonalibus ut videtur basaliter sessiliterque affixis saepe minute granulatis glabris valde angulatis; gynobasi plana vix 0.9 alta; stigmate crasso.—YUNNAN: below Mahoang Patze, on road to Deadman's Paddock, Yangtze Watershed, east slope of Likiang Snow Range, Pref. Dist. of Likiang, *Rock 6069* (G); Yangtze Watershed, east slope of Likiang Snow

Range, alt. 4000 m. *Rock 9449* (G); alpine meadow at Ladsaka Djio, Yangtze Watershed, east slope of Likiang Snow Range, alt. 3500 m., *Rock 10637* (TYPE, Gray Herb.); alpine meadow, Yangtze Watershed, east slope of Likiang Snow Range, Pref. Dist. of Likiang, 3900–4800 m. alt., *Rock 4817* (G); stony places along rivulets on the eastern slopes of snowy mountains near Likiang, 3900 m. alt., *Schneider 1800* (G).—A species readily recognized by its contorted pedicels. It appears to be most closely related to *T. vestita* (Hemsley) Johnston, but differs in its somewhat coarser stems, annual habit, coarser tortuous pedicels and larger light-colored non-papillose nutlets.

3896 **Trigonotis Rockii**, sp. nov., perennis dense caespitosa; foliis firmiter herbaceis integerrimis concoloribus enervatis sparse strigosis, basalibus ellipticis vel ovatis 12–28 mm. longis 8–13 mm. latis conspicue mucronatis basi apiceque obtusis rotundisve 1–2.5 cm. longe petiolatis, caulinis reductis sessilibus ovatis vel oblongis saepe acutis; caulibus 5–10 cm. altis erectis basi saepe ascendentibus conspicue sparseque strigosis simplicibus; inflorescentia scorpoideo-racemosa, flore infimo in axilla bracteae foliaceae ceteris ebracteatis; pedicellis 2.5–5 mm. longis strigosis saepe ascendentibus; calyce 5-partito strigoso-villoso, lobis anguste oblongis vel oblanceolato-oblongis obtusis ca. 2 mm. longis; corolla caerulea subrotata 7–9 mm. diametro, tubo ca. 2 mm. longo calycem vix superante, lobis suborbiculatis, fornicibus trapeziformibus sparse pubescentibus; filamentis supra medium tubum affixis; antheris oblongis quam filamenta duplo longioribus; stylo tubum corollae vix superante; stigmate integro disciformi; nuculis 4 obscure irregulariterque tetragonalibus ut videtur anguste basaliter affixis ca. 2 mm. longis latisque glabris inconspicue humiliterque tuberculatis; gynobasi plana.—YUNNAN: Peshive River on walls of glacier, Yangtze Watershed, Prefectoral District of Likiang, eastern slopes of Likiang Snow Range, *Rock 5256* (TYPE, Gray Herb.); below the giant glaciers on slopes of snowy mountains near Likiang, alt. 3600 m., *Schneider 3868* (G).—A very distinct species apparently most related to *T. radicans* (Turcz.) Stev. from which it is widely separated geographically and differs in its more compact habit, evident sparse strigose pubescence, nerveless firmer leaves, shorter pedicels, and brown glabrous nutlets. In gross habit *T. Rockii* much suggests *Omphalodes* but the few nutlets discovered among the debris about the roots of Mr. Rock's collection are clearly those of a *Trigonotis*.

3889 **Trigonotis vestita** (Hemsley), comb. nov. *T. peduncularis*, var. *vestita* Hemsley, Jour. Linn. Soc. xxvi. 154 (1890).—Clearly distinct

from the widely distributed weedy *T. peduncularis* (Trev.) Benth. in its more persistent root, finer more appressed canescent pubescence, and larger flowers. Mr. Rock, under number *4237*, collected *T. vestita* at Ta Ho Shan in the Yangtze Watershed at 4100 m. alt. on the western slopes of the Likiang Snow Range. He notes the flowers as white.

3480 **Trigonotis tibetica** (Clarke), comb. nov. *Eritrichium tibeticum* Clarke in Hook. Fl. Brit. India. iv. 165 (1883). *E. tibeticum*, var. *minor* Clarke, l. c.—Authentic material of *Eritrichium tibeticum* contained in the Gray Herbarium shows that this species is a well marked member of the genus *Trigonotis*. The extremely reduced alpine form of the species is apparently worthy of nomenclatorial recognition and 3481 may be called **T. tibetica**, var. **minor** (Clarke), comb. nov.

LITHOSPERMUM ZOLLINGERI A. DC. x. 587 (1846); Forbes & Hemsley, Jour. Linn. Soc. xxvi. 155 (1890). *Plagiobothrys* (?) *Zollingeri* Johnston, Contr. Gray Herb. n. s. lxxiii. 68 (1924).—This plant was incorrectly refered to *Plagiobothrys*. It is clearly a *Lithospermum* and is from Japan, being attributed to Java through error, DC. l. c. xvii. 319 (1873). A photograph of the type, which was made for me by Dr. H. M. Hall, shows the plant to be the common blue-flowered *Lithospermum* of Japan and China.

3482 **Microula hirsuta**, sp. nov., herba 15–60 cm. alta e rhizomate crasso horizontali oriens; caulibus griseo-hirsutis laxe breviterque ramosis; foliis caulinis dissitis herbaceis integris subtus pallidioribus breviter hispidis, infimis longe petiolatis, superioribus breviter petiolatis vel sessilibus, laminis oblongis vel ovato-oblongis 2–4 cm. latis; cymulis paucifloris congestis bracteatis terminalibus vel in axillis foliorum sessilibus; calyce 5-partito, lobis lanceolatis hispidis quam corollae tubus duplo vel triplo longioribus maturitate paullo auctis conniventibus 5–6 mm. longis; pedicellis 2–4 mm. longis cernuis; corolla caerulea, tubo subcylindrico vix 2.5 mm. longo vix 2 mm. diametro, limbo ca. 6.5 mm. diametro, lobis orbicularibus ca. 2.5 mm. latis patentibus; faucibus brevibus; fornicibus 5 trapeziformibus villosociliatis 0.8 mm. longis; staminibus inclusis medio tubo affixis; filamentis 1 mm. longis; antheris oblongis; nuculis 4 pallidis minute denseque muriculatis rugosis subtrigonis acutis vix 3 mm. longis dorso medio cum areola 1–1.5 mm. longa oblonga prominenti ornatis; stylo lineari compresso 1.5–2 mm. longo nuculas vix superante.—YUNNAN: *Abies* forest at Yakolo, eastern slopes of Mt. Dyinaloko, northern peak of the Likiang Snow Range, 4100 m. alt., *Rock 10439* (TYPE, Gray Herb.); in *Abies* forest, Yangtze Watershed, eastern slope of Likiang

Snow Range, Pref. Dist. of Likiang, *Rock 5792* (G); Yangtze Watershed, eastern slopes of Likiang Snow Range, Pref. Dist. of Likiang, *Rock 4977* (US); rocky stream-ways on the snowy mountains near Likiang, 3800 m. alt., *Schneider 3657* (G); eastern slope of the snowy mountains near Likiang, 3400 m. alt., *Schneider 3640* (G).—A species related to *M. sikkimensis* (Clarke) Oliver, but differing in its slightly larger, pubescent, differently proportioned corolla, somewhat coarser habit, and lack of minute dense strigose pubescence under the coarse stiff hairs of the foliage. In *M. hirsuta* the corolla-lobes are somewhat hispid-strigose outside, the corolla-tube is scarcely one-half the length of the calyx-lobes, and the throat-appendages are villous, whereas in *M. sikkimensis* the corolla is glabrous, the tube twice exceeds the calyx, and the throat-appendages are glabrous. Furthermore the filaments are longer and the anthers are smaller in *M. hirsuta* than in its relative. *Microula hirsuta* is known only from the high snow-capped mountains in the vicinity of Likiang, Yunnan. *Microula sikkimensis* is at hand from Sikkim and western Szechuan. The plate given by Oliver, Hook. Icones xxiii. t. 2255 (1893), is not clearly diagnostic. It appears to represent *M. sikkimensis*. In this connection it may be well to mention that several fine collections of *M. myosotidea* made by Mr. Rock have rendered it certain that Franchet's genus *Schistocaryum* is indeed a synonym of *Microula*, and in addition have shown that *M. myosotidea* is related most closely to *M. pustulata* (Clarke) Duthie.

CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY

NEW SERIES—VOL. III (NOS. LI-LXXV)

TITLE-PAGE, CONTENTS, DATES OF ISSUE, ERRATA, AND INDEX

COMPILED BY

FLORENCE M. GODBEER

PUBLISHED BY

THE GRAY HERBARIUM OF HARVARD UNIVERSITY

CAMBRIDGE, MASS., U. S. A.

FEBRUARY, 1927

MISSOURI BOTANICAL GARDEN

INDEX

TO THE

CONTRIBUTIONS FROM THE GRAY HERBARIUM

New Series, Vol. 3 (Nos. 51–75)

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Florence M. Godbeer

New names are in **full face** type. The Roman numeral gives the number of the Contribution, the Arabic the page.

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In citing such of these Contributions as have been published in serials it is strongly recommended that the name of the original journal should be given, together with the volume, page, and date. For example: *Pyrus dumosa* (Greene) Fernald, Rhodora, xxiii. 266 (1922), not Contributions from the Gray Herbarium, new series, lxiii. 266 (1922). Numbers 52–54, 56, 59, 61, 64, 65, 68, 70, 73–75, on the other hand, were published independently and should be cited under the title of the series.

At the time when these Contributions from the Gray Herbarium were first numbered in the present sequence they were distinguished by the expression "New Series" from many unnumbered or personally numbered papers of similar nature, which has been previously prepared at the same establishment by Prof. Asa Gray, Dr. Sereno Watson, and others. It is now believed that the time has passed when any confusion with these earlier publications is likely to occur, and for convenience of citation the words "New Series" will be dropped from the succeeding papers of this series.

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